SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIII.—No. 13. ESTABLISHED 1845. NEW YORK, SEPTEMBER 28, 1895 $3.00 A YEAR. WEEKLY.

PENNSYLVANIA COAL MINING.

The accompanying illustrations, from photographs representing the work at the Bast colliery, near Pottsville, Pa., give a good idea of the great amount of handling and the very extensive plant necessary in connection with the operating of a large coal mine. Although the production of coal in the United States now amounts to about two hundred million tons annually, only about fifty million tons of this aggregate is anthracite, and comes almost exclusively from Pennsylvania, while mines yielding bituminous coal are pretty well scattered over the country. But few people, however, realize the great amount of labor required to properly make the coal ready for market in the several sizes of lump, broken, egg or furnace, stove, nut, chestnut, pea, buckwheat, and the final culm, and to free the good coal from slate and stone. The total number of employes in and about the anthracite mines of Pennsylvania, according to the completed government statistics for 1893, was 132,944 men and boys, and their average working time for the year was 197 days. The mine furnishing the subject of our illustrations is in the West Mahanoy district, Schuylkill County, and is one of the mines of the system of the Philadelphia and Reading Coal and Iron Company.

In Fig. 1 is illustrated the clearing of the lump coal from the hoisting shute and the breaking up of the large masses by hand by means of picks directing the lumps into the breaker shutes with forked spades. In Figs. 2 and 3 nimble fingers are seen picking out slate or other stone from the cross boxes or slides. The slate being cast into small shutes in front of each pair of boys, descends into a longitudinal shute which carries it to the waste heap. When each charge of coal in the cross box has been cleared of slate it is dumped into a discharge shute on the opposite side of the picking trough by lifting a shutter, when a new charge is taken into the picking box from the feed shute on the other side.

(Continued on page 201.)

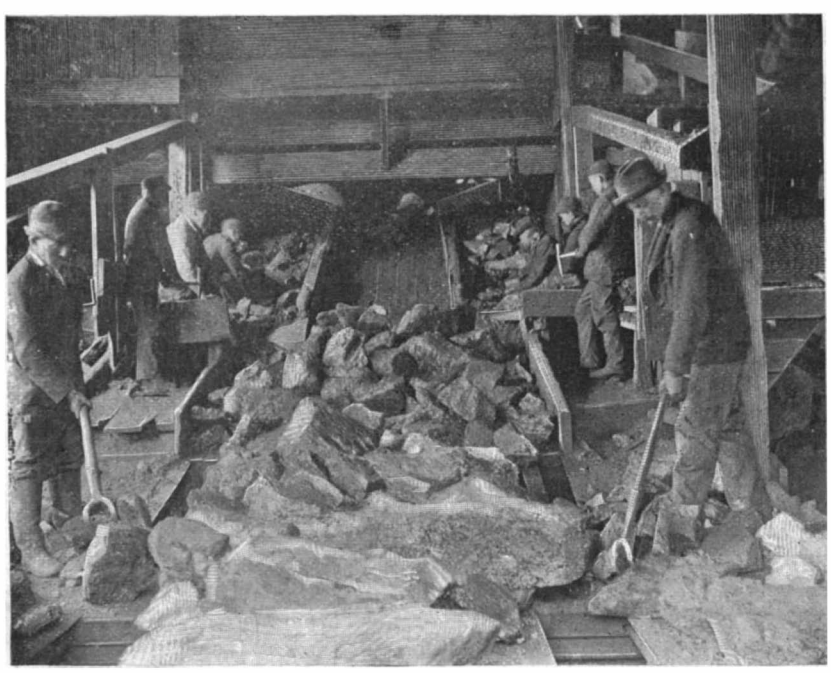


Fig. 1.—CLEARING THE LUMP COAL FROM THE HOISTING SHUTE.

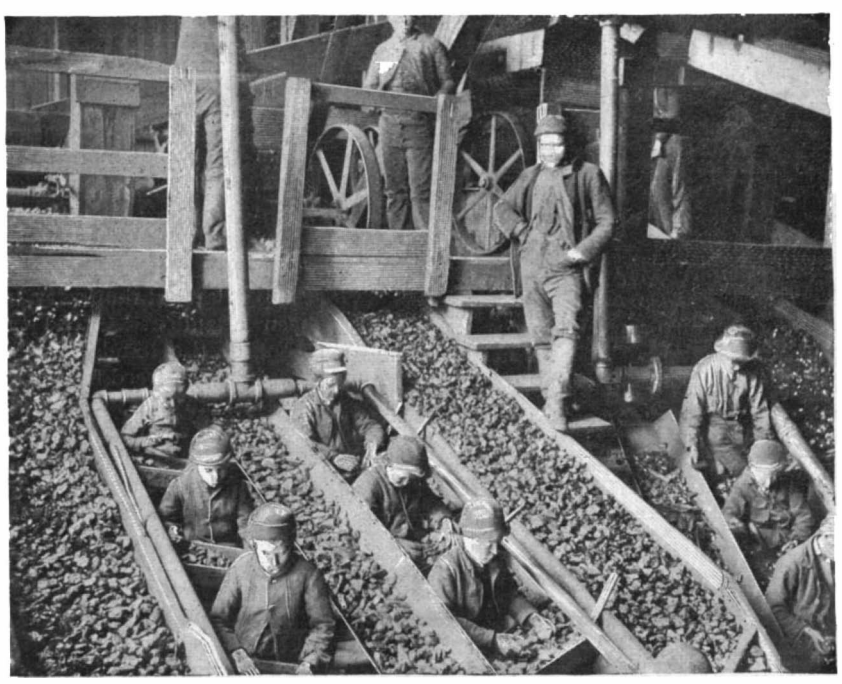
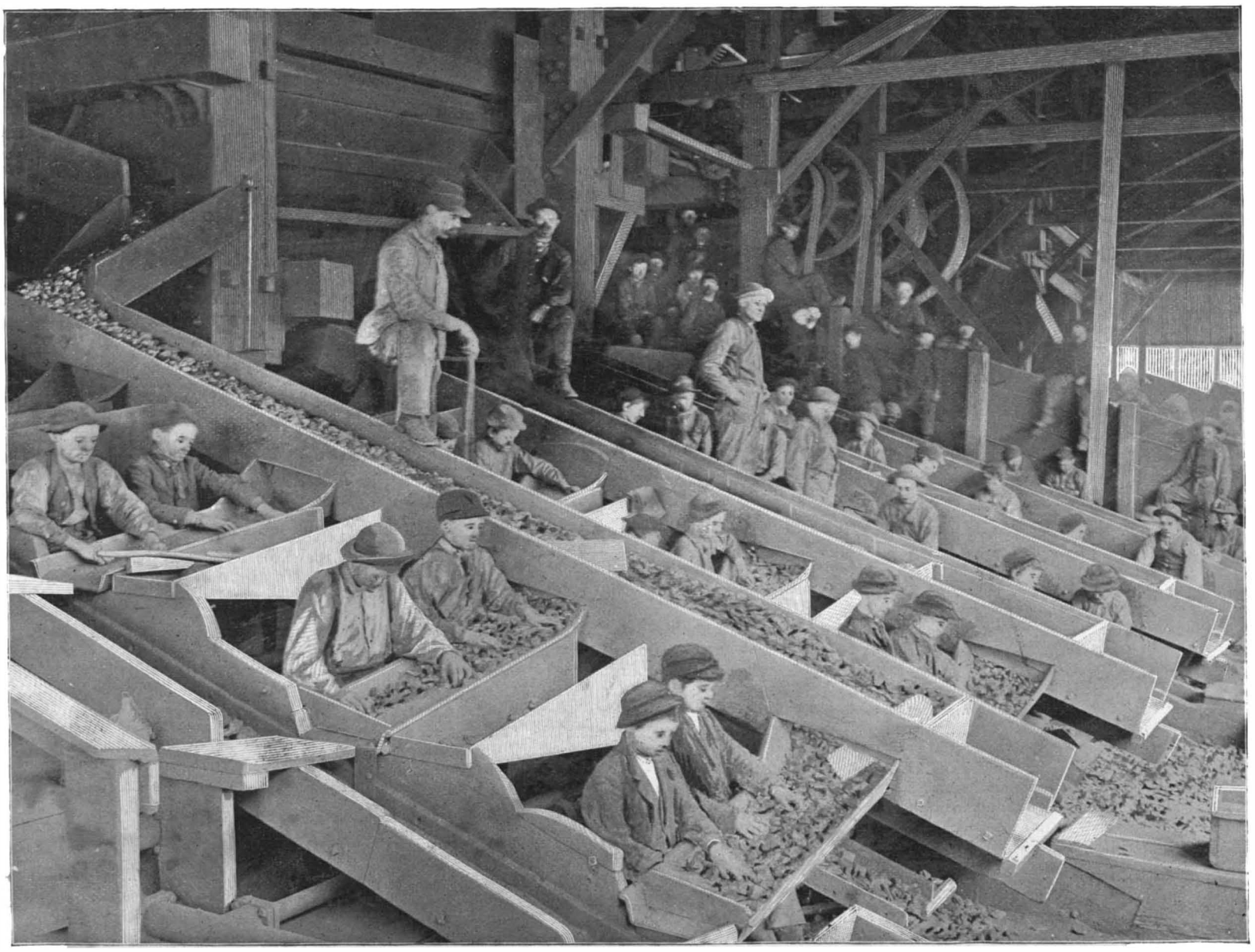


Fig. 3.—ASSORTING COAL—PICKING OUT SLATE.



PENNSYLVANIA COAL MINING—BOYS PICKING COAL AT THE BAST COLLIERY.—Fig. 2.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

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NEW YORK, SATURDAY, SEPTEMBER 28, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1030.

For the Week Ending September 28, 1895.

Price 10 cents. For sale by all newsdealers.

THE OPENING OF THE COTTON STATES AND INTERNATIONAL EXPOSITION.

Late in the afternoon of Wednesday, September 18, in the study of his private residence, at Buzzard's Bay, Mass., President Cleveland pressed the electric button which set in motion the machinery of the great Southern Exposition, at Atlanta, Ga. A vast collection of the products of the arts and sciences on a scale like this has at any time or place an intrinsic value as such; but in the case of this Southern Exposition there are circumstances preceding and accompanying it that lift it above the level of the mere spectacular and invest it with a special historical significance and dignity. It marks the coming of age, the ripening into the full strength of robust manhood, of what has been aptly called "the new South." Thirty years ago, on these very grounds where these people have now gathered the fruits of their peaceful industries, they were locked in the embrace of one of the bloodiest battles of the civil war. The landscape gardener, as he smoothed out the green lawns that beautify the Exposition grounds, had to fill in many a rifle pit, from which the advance of General Sherman upon the doomed city of Atlanta had been contested with unavailing courage. From this battlefield, on these very grounds, may be traced the course of that successful campaign that ended in the liberation of the negro and the triumph of the Union. Atlanta, a mass of blackened ruins, was a type of the utter and hopeless chaos that prevailed through this Southern country but thirty years ago.

The recovery has been very slow, but very sure. Political, economic and racial problems have been solved. Wearily, and amid heart-breaking discouragements, this sorely stricken country has wrestled with obstacles that would have daunted a less dauntless race. Prejudices and traditions that were old as the hills have been cast aside. The easy indolence, the patriarchal simplicity, of the old plantation life has been abandoned. The true dignity of labor, even labor of the hands, has been recognized; and this great people, freed from the burden of slavery by the rude stroke of war, has of its own free will broken away from the traditions of the past, and has thrown itself into the strife of modern industrial competition, with a persistence, intelligence, and success to which the Atlanta Exposition is an imposing and eloquent witness.

Thirty years ago, when Sherman set out on his famous "march to the sea," he left the city of Atlanta a mass of blackened and smoking ruins. To-day the visitor will find a thriving city of 110,000 inhabitants, replete with every modern appliance for municipal well being, and boasting of a larger variety of manufacturing interests than perhaps any other city in the United States.

This Southern country is no longer merely the land of the cotton plant, the tobacco plant, and the sugar cane. Its vast natural mineral wealth is being rapidly developed. Coal and iron—those most potent factors in the work of building up a people in wealth and population—are being mined in rapidly increasing quantities. Large and expensive plants for the manufacture of iron and steel have been laid down. The extensive opening and development of the coal beds has attracted manufacturers in a large variety of trades; and this to such an extent that the Southern manufactured goods are entering into successful competition in the markets of the North.

The tide of immigration, which of late years has set steadily westward, is now trending to the South. The great cotton plantations embrace vast areas of land that are suitable for a more mixed and more profitable agriculture. This soil is rich, cheap, and favored with a climate much superior to that which obtains on the vast plains of Western America. The farmer of the far West is located at too great a distance from the centers of population to be able to market his produce to the best advantage; and he is completely at the mercy of the particular railroad that happens to serve his district. The large, unoccupied, or practically unoccupied, lands of the South, on the other hand, are all well within reach of the larger cities; and it is seldom that they are held in the grasp of an individual railroad monopoly. These facts are beginning to be realized. From the West and from the North the farmers are migrating in increasing numbers to try their fortunes in this favored country. The infusion of new blood is having a healthy and stimulating effect upon the people; and it is manifest in the social and commercial quickening of the whole of the Southern States.

The inaugural exercises of the Exposition were on a scale that was worthy of the event; and, like the Exposition itself, they were marked by features that gave them an interest that was more than spectacular; features that were the visible expression of deep, underlying principles which have long striven for utterance, and have at last found it in certain significant and never-to-be-forgotten events that figured in the programme of this remarkable day. The Atlanta Exposition will be recorded in the history of the South as the day of reconciliation between the whites and the negroes. It marks the close of a bitter and openly avowed racial war; and inaugurates an era of fraternal toleration and mutual confidence that will consolidate and enrich the South in the years to come. In the parade that marched through streets that were gay with the stars and stripes a detachment of negro soldiers marched in procession with the citizen soldiers of Georgia and Louisiana. Later in the day a negro stood upon the platform of the auditorium, surrounded by the illustrious orators of the day, and with native eloquence pleaded for the recognition of his people, amid the united thunderous applause of his white and colored audience.

Conspicuous among the many buildings of the Exposition stands one that has been expressly built and set apart for the exhibit of the progress in the arts and sciences of the colored people. So that, just at a time when alarmists were foretelling the disruption for a second time of these Southern States upon the negro question, we find that they have taken hold of the problem in a spirit worthy of the best traditions of the Constitution; and, realizing that "all men are created equal," they have lifted their unfortunate brother to the same platform of social, political and humanitarian rights as themselves.

If the Atlanta Exposition of 1895 should serve no other end than this, it will have done a noble work. On the page of history it will stand out as one of the great milestones which mark the onward progress of our country toward the perfect fulfillment of the dreams of its liberators and of the founders of its Constitution.

THE SECOND-CLASS BATTLESHIP MAINE.

On Tuesday, September 17, the new battleship Maine was placed in commission, and the moment she flew the stars and stripes from her peak she took rank as the most powerful fighting ship in the new American navy. It is true there are ships in the builders' hands, such as the Illinois and the Oregon, that will far outrank the Maine on every point of comparison, except that of speed; but of the ships in our navy that are fit and furnished for battle, the Maine easily takes first place.

She was built at the Brooklyn navy yard, her keel plate being laid on October 11, 1888, and the launch taking place November 18, 1890. Her dimensions are: water line length, 318 feet; breadth, 57 feet; mean draught, 21 feet 6 inches; and displacement, 6,648 tons. The twin screws are driven by the usual type of vertical, triple expansion engines, and they develop 9,000 indicated horse power. This should give a sustained sea speed of 17 knots an hour. On her trial trip, which was run before her heavy guns were on board, she realized the high speed, for a battleship, of 18·37 knots an hour.

In armament and disposition of armor, the Maine is similar to the Chinese battleship Chen Yuen, which acquitted itself so creditably in the fierce battle of the Yalu. The main battery consists of four modern 10 inch guns, mounted in two turrets. The turrets are plated with 8 inch steel, and they revolve within barbettes of 12 inch steel, which serve to protect the hoisting and turning machinery. These barbettes are carried down to the level of the water line belt of 12 inch steel. This gives an unbroken wall of protection from the guns to the water line. The turrets are arranged diagonally amidships, and the superstructures are so disposed that all four guns can be fired at once, either ahead, astern, or on either broadside.

The secondary battery includes six 6 inch guns, of which three can be at any one time trained ahead, astern, or on the beam. They are protected with 2 inch shields. There are also eight 6 pounders, eight 1 pounders, and four Gatling guns. The water line armor belt is 180 feet long and 12 inches thick. The Maine carries four torpedo tubes, one ahead, one astern, and one on either broadside.

Battleship construction is a matter of compromise. On a given displacement the designer has to harmonize all the elements that call for recognition, such as guns, armor, speed, coal supply, giving so much to each as shall not necessitate undue reduction in the others. In this respect the Maine is apparently a distinct success. She has a powerful main battery that is well protected; a numerous secondary battery; a good armor belt at the water line; effective torpedo service; and, best of all, high speed. That all these points should have been embodied in a ship of only 6,648 tons displacement is greatly to the credit of the Naval Board.

THE COLLAPSE OF THE COLISEUM BUILDING, CHICAGO.

They evidently have object lessons in Chicago, as well as in New York, as to what not to do in the construction of large buildings. The fall of the Ireland building, in this city, has impressed, or should have impressed, the municipal authorities with the necessity for stringent building laws as a protection for the lives of the citizens that live beneath their rule.

This time it is in Chicago that unskilled design and

hasty workmanship have resulted in a structural wreck, which might easily have quadrupled the massacre that took place recently in West Broadway. It seems that a vast hall, that was to cover some five acres of ground, and that was to be capable of seating 16,000 people, collapsed under its own weight when about three-fourths of it had been erected. The roof, which was built of steel and timber, was similar in design to that of the Machinery Hall at the Columbian Exposition; and it was carried on fourteen trusses, which had each a clear span of over 200 feet.

Eleven of these had been erected, and the work of sheeting was in progress, some 50,000 feet or 75 tons of timber being piled upon the roof at the time of the fall. The collapse was complete; some of the trusses falling over sideways and others twisting out of shape and crumpling up, as if under the mere stress of their own weight. Fortunately, no one was hurt. We are told that "engineers regard this as one of the worst building failures that has occurred in the West for a number of years." Well they may! Not only was the structure free from the load of the sheeting and roofing material that was yet to be put upon it, but it was not, so far as appears, subject to any wind pressure at the time of the fall. Now this roof that was intended to shelter safely some 16,000 souls was supposed, according to sound engineering practice, to be able to withstand fully four times the greatest strain that its own weight and the force of the strongest wind combined could bring upon it, before it would collapse. As a matter of fact, however, it fell on a quiet night and before even its own full weight of material had been built in place. It is well that it did! Had the wreck come when 16,000 souls were seeking its shelter, and had that five acres of steel, glass, and timber come crashing down upon the people like a network of death, history would have had to chronicle on that night the most awful calamity of the century.

The contractor acted as his own engineer. The work was being rushed. The huge trusses were assembled and hastily bolted together with temporary connections. Such work should never be rushed; and such work, both in design and execution, should be done under the searching scrutiny of a qualified engineering board.

Caring for Good Roads.

So important is the subject of keeping Macadam and Telford roads in proper repair that the Road Improvement Association, of London, England, recently issued a circular containing seventeen rules for the guidance of roadmasters in this matter. These directions cover nearly the whole ground, and if properly followed, they will save money. But in order to carry out the best rules for keeping the roads in repair, it is necessary that some responsible roadmaster should be selected for the work, and proper funds be placed annually at his disposal. A few years ago prizes were offered to the road supervisors on Long Island who could show the finest stretch of roads in each district. A great stimulus was thus given to road making, and every supervisor made efforts to secure the cash bonus. The results obtained were so good that they might justify the annual offer of cash prizes to the supervisors who keep their Macadam roads already constructed in the best repair.

The rules adopted by the Road Improvement Association, of London, should be read and studied by every roadmaster and supervisor. They run as follows:

1. Never allow a hollow, a rut, or a puddle to remain on a road, but fill it up at once with chips from the stone heap.
2. Always use chips for patching and for all repairs during the summer season.
3. Never put fresh stones on the road, if, by cross-picking and a thorough use of the rake, the surface can be made smooth and kept at the proper strength and section.
4. Remember that the rake is the most useful tool in your collection, and it should be kept close at hand the whole year round.
5. Do not spread large patches of stone over the whole width of the road, but coat the middle or horse track first, and when this has worn in coat each of the sides in turn.
6. In moderately dry weather and on hard roads always pick up the old surface into ridges six inches apart, and remove all large and projecting stones before applying a new coating.
7. Never spread stones more than one stone deep, but add a second layer when the first has worn in, if one coat be not enough.
8. Never shoot stones on the road and crack them where they lie, or a smooth surface will be out of the question.
9. Never put a stone upon the road for repairing purposes that will not freely pass in every direction through a two inch ring, and remember that smaller stones should be used for patching and for all slight repairs.
10. Recollect that hard stones should be broken to finer gage than soft, but that the two-inch gage is the largest that should be used under any circumstances where no steam roller is employed.
11. Never be without your ring gage; remember Macadam's advice that any stone you cannot easily put in your mouth should be broken smaller.
12. Use chips, if possible, for binding newly laid stones together, and remember that road sweepings, horse droppings, sods or grass and other rubbish, when used for this purpose, will ruin the best road ever constructed.
13. Remember that water-worn or rounded stones should never be used upon steep gradients, or they will fail to bind together.
14. Never allow dust or mud to lie on the surface of the roads, for either of these will double the cost of maintenance.
15. Recollect that dust becomes mud at the first shower, and that mud forms a wet blanket which will keep a road in a filthy condition for weeks at a time, instead of allowing it to dry in a few hours.
16. Remember that the middle of the road should always be a little higher than the sides, so that the rain may run into the side gutters at once.
17. Never allow the water tables, gutters, and ditches to clog, but keep them clear the whole year through.

It is reasonable to predict that road improvement is destined to spread with great rapidity in the next ten years, and that capital which heretofore built railroads will now seek investment in fine macadamized roads. The first necessity for developing a country of the size of the United States was a system of railroads that would bind together the widely separated points of industry and population, and the construction of such a stupendous system absorbed most of the energy and capital of our financiers. But the country now is better supplied with railroads than any other on the face of the globe, and the limit to the extension of long railroad lines is practically reached in many parts of the country. It is impossible to have every small hamlet and village connected with the main railroad lines by short branches, but the transportation problem cannot be said to be solved until every small place and farm of any size is connected with the great arteries of commerce by means of fine macadamized roads. It is this necessity for building more and better common roads that makes the question such a burning one to-day. The next generation must devote itself to the construction and improvement of common roads, feeding the railroads with the products of the great agricultural regions.

The total length of the common roads in this country, good, bad, and indifferent, is estimated by Gen. Stone, of the Road Bureau of the Department of Agriculture, at something over 1,300,000 miles. The majority of these roads have been opened by common laborers hired by county supervisors, and no engineering principles have been observed in their construction. As a result, it costs more to keep them in repair than if they were so many finely macadamized roads. Keeping these poor roads in repair and opening new thoroughfares cost Massachusetts, in 1893, outside of cities, $1,136,944, or $66.30 per mile; New York, $2,500,000, or $30 per mile; and New Jersey, $778,470.82, or $43.25 per mile. The total expenditure for roads in that year amounted to about $20,000,000. As a greater part of this enormous sum was spent to repair poorly constructed roads that would need exactly the same improvements again the next year, it is not an exaggeration to say that most of the money was wasted.

Fine roads can be constructed all the way from $400 to $5,000 per mile, according to the nature of the country through which they pass, the cost of crushed stones and other engineering problems. The cost of keeping these roads in repair is infinitely smaller than that required to repair the ordinary dirt roads each winter and spring when great gullies and ruts are washed into them by the rains and floods. The secret of the success of the fine roads in France is attributed to the prompt and systematic repairs made at all seasons of the year. This principle is observed upon our best railroads, and the great trunk lines that reduce the wear and tear to the smallest minimum by promptly repairing any defect or injury make the most money. This rule is just as true with macadamized roads. It is economy both for the roads and the vehicles to repair the slightest defect as soon as discovered, and before it has had time to spread.—Evening Post, N. Y.

The Possibilities in the Electrical Future.

A correspondent in the Syracuse Standard signing himself A Dreamer, says: "Many trained electricians are working to give the world a cheap and practical storage battery. The moment this is accomplished what possibilities are before us! To say nothing of electricity to furnish inexpensive power for land, water and possibly aerial travel, think of its domestic applications! Fancy a moderate sized windmill in or on the rear of one's house, when the air is in motion, hour by hour making and storing up the subtile fluid, to be drawn on at pleasure for heating, lighting, cooking, ironing, and other home uses; to charge the battery of one's moderate priced horseless carriage, to revolve the electric fan, run the sewing and washing machine, and possibly rock the baby, and in fact revolutionize our ways of living.

"Nothing is too novel to be expected or at least be possible, and that which to-day provokes our laughter, a decade from now may be part of our everyday life. As I have often said, it is one of my chief regrets that I could not have come on earth one generation later."

Cycle Notes.

At Bordeaux, France, September 8, M. Huret covered 851 kilometers and 856 meters in 24 hours, which is equal to 529⅓ miles. Riviere's record was 523 miles 1,029 yards. At the recent Springfield meeting Titus rode 27 miles and 185 yards in one hour.

Some time ago, Henri Rochefort said in L'Intransigeant that he did not believe in bull fights, unless the horses were replaced by unbreakable cycles. This has now been done, but the Spanish public does not care for the innovation. Carlos Rodriguez, a well known cyclist, and Badila, the picador of the Quadrille de Mazzantini, both entered the arena mounted on cycles. The former soon ran away from the bull, but the latter stood his ground, and being unable to turn quickly enough, both machine and rider were thrown high in the air by the infuriated animal. The rider was, happily, not hurt, but the machine demonstrated that unbreakable cycles do not exist.

In 1894 France obtained $300,366 from the taxation of bicycles. The number of wheels declared was 147,977. The amount received from the tax was nearly five times that obtained during the same period from the taxation of horses and other animals used for drawing vehicles.

Lieut. G. W. Stevens, of the First Artillery at Fort Hamilton, reported the results of a very satisfactory bicycle tour to Gen. Miles at Governor's Island on September 17.

Under orders from headquarters Lieut. Stevens started ten days previously for Philadelphia, Wilmington, Washington and Virginia to learn the condition of the roads for bicycling. This was part of a plan to get accurate information on all main traveled roads in the country. Lieut. Stevens traveled 800 miles in ten days. He returned from Washington by a different route, covering the distance in two days. The return trip from Philadelphia was made in seven hours.

A bicycle club has been formed at Salonica, the Thessalonica of ancient times, to which city Paul addressed his epistle to the Thessalonians.

"The mountain climber" consists of a plate fastened to the sole of the shoe. This plate engages the attachment which is fastened to the pedal. It gives power to the up-stroke of the foot, thus overcoming the dead center. It weighs less than two ounces.

The United States Tobacco Journal states that the falling off in the demand for cigars will amount this year to 700,000,000 cigars, and this loss is very generally credited to cycling.

The army signal officers have equipped their service with an ingenious arrangement for distributing telegraph and telephone wires. It was found that in throwing insulated or naked wires on the ground preparatory to establishing communicating stations, the weight of the reel was considerable, and it had to be carried on some kind of a hand cart. The latest method is to carry the wire on a reel which is affixed to a bicycle. The rider by his propulsion of the wheel distributes the wire in the track of the machine. The reel is connected with the front bicycle wheel, so that the wire may be rapidly gathered up from the ground automatically. The reel is borne in front of the handle bar. The bicycle is made very heavy to guard against accidents and to support the additional weight. The various telegraphic and telephonic instruments are carried in boxes which are fastened to the frame.

It is now said that the output of wheels for 1896 will not be far from 800,000.

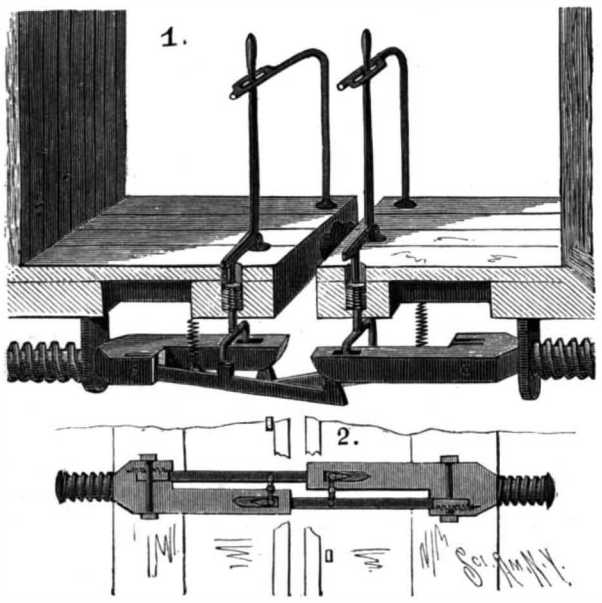
A landlord having refused to permit his tenant to take his bicycle into his flat, a lawsuit has been brought to determine whether or not the tenant has a right to take his bicycle into his leased office or flat. Some property owners were quick to see the advantage of offerering accommodations for wheelmen and now advertise their property with the information that there is accommodation for bicycles. The New York Sun says, in speaking of the houses of the future: "Bicycle stands in dwelling houses are as sure a part of their ordinary furniture and equipment as the umbrella stand is already."

The New York Fire Department has under consideration the construction of a bicycle chemical engine for use in the up-town and suburban districts. The plan proposed contemplates a light chemical engine of from 30 to 40 gallons capacity, which will be propelled by four men, which would make much better time than the horses do. Out of 1,100 men in the fire department, 300 now ride bicycles.

THE prize of $2,400 awarded every six years to the author of the most useful discovery to French industry has been given to Professor Lippmann for his method of photographing colors.

A SIMPLE AND INEXPENSIVE CAR COUPLING.

The coupling shown in the accompanying illustration is virtually composed of but two pieces, and is designed to be exceedingly simple, practical, and economical. It has been patented by Thomas Griffith, of the United

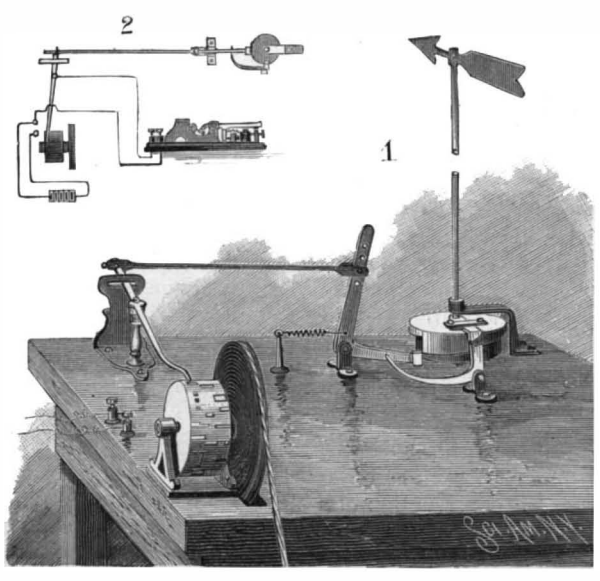


GRIFFITH'S CAR COUPLING.

States Army, Columbus Barracks, Ohio. Fig. 1 shows the improved coupling in position, portions of the car ends being broken away, and Fig. 2 is a plan view. The drawbar has the usual spring at the rear, and in front, at one side, is a forward extension vertically apertured in alignment with an inclined or beveled guideway on its underside. At the opposite side of the drawhead is journaled a coupling bar having at its forward end a hook adapted to slide in the beveled guideway to engage its hook in the vertical aperture of the drawhead of an approaching car provided with the improvement, the coupling bar being drawn upward by a spring extending from it to the underside of the car platform. The drawheads at adjacent ends of the cars to be coupled are exactly similar, except that the forward extension of one drawhead is opposite the coupling bar of the other drawhead. To disengage the coupling hooks, a two-armed lever having an upwardly extending handle is arranged for vertical movement in apertures in the car platform, coiled springs holding the arms normally in raised position, but on movement of the lever handle the arms are pressed downward, simultaneously pushing down the coupling bar of one car and the hook of the coupling bar of the other car, as shown in Fig. 1.

AN ELECTRICAL SIGNAL TRANSMITTER.

To transmit electrical signals for record at a distant point, and more particularly for use in connection with a weather vane or other meteorological apparatus, the improvement represented in the illustration has been patented by W. H. Davis and Hugh C. Christy, of Como, Col. On the weather vane shaft is a helical cam engaged by the shorter arm of an angled lever pivoted in a standard, as shown in Fig. 1, and the longer arm of the lever is adjustably connected by a rod with one end of a pivoted contact lever whose other end rests on a revoluble drum, driven from any continuously revolving shaft. As the vane shaft is revolved in one direction by the wind, the cam moves the shorter arm of the lever down, and when the

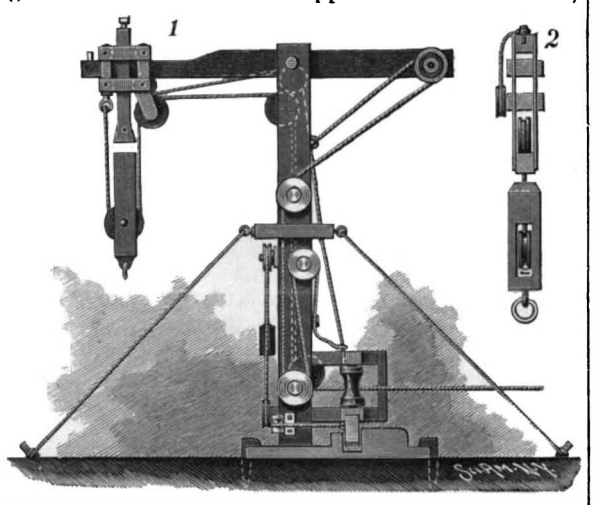


DAVIS AND CHRISTY'S SIGNAL TRANSMITTER.

deeper portion of the cam rides past the arm is raised by the retractile spring connected with the other arm. When the shaft revolves in the opposite direction, the short arm of the lever is carried down below the cam shoulder by an angled lever pivoted in a standard, a curved arm engaging the short arm of the lever, while the short arm of the second lever is engaged by a spring-pressed toe on the cam, at a point about ninety degrees distant from the shoulder. The contact lever is thus swung to bring its free end into electrical contact with the contact surfaces of the revoluble drum. The latter is preferably made of metal with insulation at its periphery and cut away at points where an electrical contact is desired. With a recording instrument located at a distance, as shown in Fig. 2, one wire of the transmitting apparatus is connected with the contact lever and the other wire is connected with one pole of a battery whose other pole is electrically connected with the drum, on whose periphery are contacts representing "North," "South," "East," and "West," or as many intermediate divisions of the compass as may be desired.

A PORTABLE DERRICK.

The derrick shown in the engraving is designed to be readily moved from place to place and erected with facility, and to automatically swing its load-carrying arm to deposit the load and automatically return the arm to normal position for engagement with another load. It is especially adapted for handling forkfuls of hay and straw in forming stacks. A patent has been granted for the improvement to Jacob Sarver, La Junta, Col. Fig. 1 shows the device in perspective, Fig. 2 being a sectional view of the parts of the derrick. The base block is secured in position by headed stakes driven into the ground, and receives the lower end of a derrick post, held upright by guy ropes. On the upper end of the post a carrier arm is pivoted to rock, and on a reduced portion of the arm is a traveling frame from which is supported a sheave block,



SARVER'S PORTABLE DERRICK.

anti-friction rollers facilitating the ready movement of the frame.

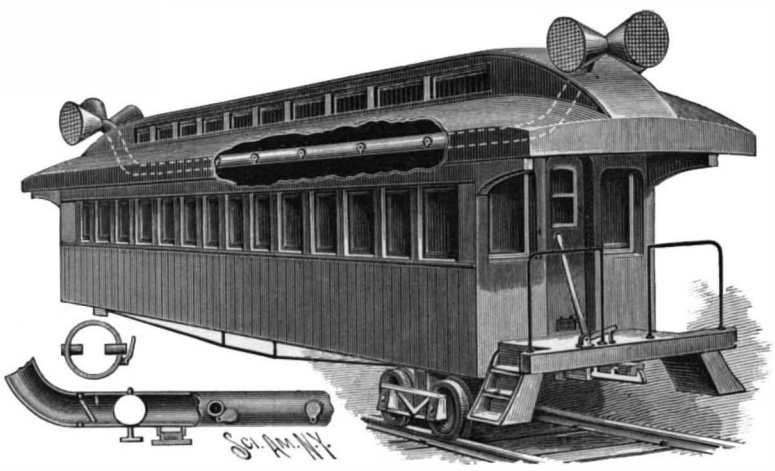
To rock the carrier arm and retain it at any desired inclination a rope extends from the post over a pulley on the rear end of the arm and thence over and around other pulleys on the post to a fastening point. The hoisting rope, secured at one end to the front portion of the traveling frame, passes down over a sheave pulley and up over a loose pulley of the frame, and thence over pulleys on the post and an idler pulley held in brackets at its base, extending horizontally for convenient connection with a team or other power. Convenient means are provided for locking the post and arm in position and for automatically releasing the arm and swinging it laterally after depositing a load, the provision for rocking or inclining the arm facilitating the deposit of its load at any required place on the stack. This derrick may be readily taken apart and packed on a wagon for convenience in moving.

Steep Gradients on Electric Roads.

The Elec. Jour. (San Francisco) for August contains an article by Lieut. Stuart-Smith, in which he gives descriptions of methods used in some of the Pacific coast cities. After giving an illustrated description of the well-known Kuhlmann counterweight system used in Seattle, he gives a detailed description, with illustrations, of the system in use in San Francisco on a 25·5 per cent grade. There are two tracks on this grade, for cars going in different directions. On the grade there is a conduit like that for cable roads, and it contains an endless cable passing over pulleys at the two ends. An up-going and a down-going car are attached to this cable by the men stationed at the grades, and the two cars then work together by the use of their own motors, the one going down hill assisting the one which is going up. The system was tested August 5 for the first time and was found to operate successfully. It has since been working to perfect satisfaction. It was found that the power of the down-going car is far more than is necessary for hauling the ascending car under any possible conditions of load.

AN EFFICIENT PASSENGER CAR VENTILATOR.

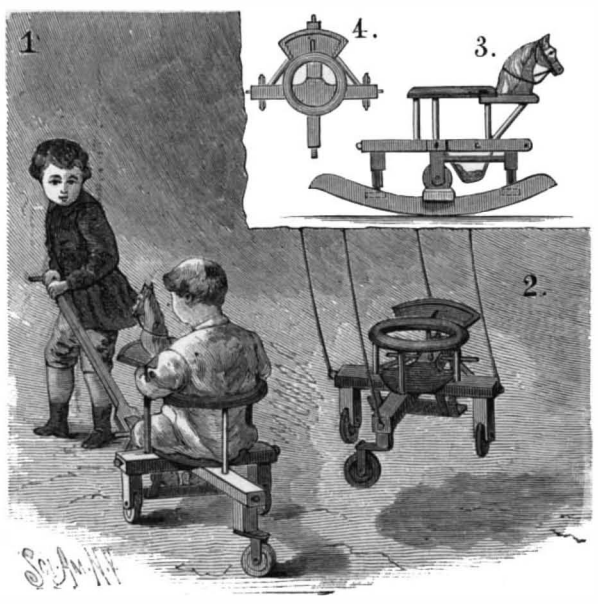
By the system of car ventilation herewith illustrated it is apparent that a moving car will at all times be abundantly supplied with fresh air, without the uncomfortable draughts caused by raising the windows. The improvement forms the subject of a patent issued to Thomas Griffith, of the United States Army, who has for years had the management of government hospitals, particularly as to ventilation and heating, and now located at the Post Hospital, Columbus Barracks, Ohio. As shown in the broken-away portion of the main view, a ventilating pipe extends lengthwise through the coach near its roof, its opposite ends being bent outward and provided with funnel-shaped cowls, whose mouths are covered with wire netting. Inside the car the pipe has air outlets consisting of short tubes at whose outer ends are deflecting plates, as shown in one of the small views, another view showing, near one end of the pipe, a valve opened by the air moving in one direction, and closed by an opposite current, while adjacent to this valve, near each end of the pipe, is a damper to regulate the air current. To permit the removal of cinders from the pipe, a collecting chamber is provided near each end with removable bottom covered by a screw cap. In the lower part of each car door is an air outlet having a covering of wire netting at one side and at the other side a hinged coverplate opening outward.



GRIFFITH'S RAILWAY CAR VENTILATOR.

MORTON'S PERAMBULATOR, ROCKER, ETC.

A composite vehicle, adapted for exercising and amusing children or invalids, and readily convertible into a wagon, a perambulator, rocking chair and swing, is represented in the accompanying illustration, and has been patented by Mr. Ellis S. Morton, of Galena, Kansas. Fig. 3 is a side view, as it appears when used as a rocking horse, Figs. 2 and 3 representing the device with the rockers and tongue removed, for use as a perambulator or swing. On the main frame, as shown in Fig. 4, a ring-like guard piece is supported on posts, a curved table being secured on the front edge of the guard piece, while at the junction of the members of the frame is a seat board, a detachable foot rest being formed by hanger bars. A block simulating the head and neck of a horse is held on the curved table by means of a thumb screw, and at the front of the frame is hinged a tongue. In depending brackets are held caster wheels adapted to swing and



A PERAMBULATOR, ROCKER, ETC.,

revolve as required, and the caster wheels are adapted to be embedded in places provided therefor in the frame bars of a detachable rocker frame, thus adapting the wheeled vehicle for use as a rocking horse or chair. To enable the device to be used as a swing, it is supported by cords connected to the main frame by hooks and eyes, as shown in Fig. 2.

A New Boiler Cleaning Compound.

The Empire Boiler Cleaning Company, of 19 Whitehall Street, New York, are introducing a new boiler compound, furnished in the form of a powder and placed in a cup attached to the top of the boiler. The steam entering the cup condenses and the moisture is quickly absorbed by the powder, which then gradually dissolves and passes into the boiler. The basis of the compound is metallic mercury, which, being set free in a finely divided state, impinges upon the surface of the tubes and plates, where it works its way under the scale, seeking the other metal, and by the combined action of heat and pressure it is claimed that it mechanically breaks away the scale and forms upon the clean iron or steel an oxide, which is a very thin coating similar to enamel. It is claimed that this enamel coating in a short time so fortifies the surface of the tubes and shell that corrosion and scale become impossible.

THE LARGEST SAILING VESSEL IN THE WORLD.

A little more than three years have passed since the proud German five-master Maria Rickmers started from an English port on its first voyage, from which it never returned. It disappeared without leaving a trace. Only one sailing vessel of similar dimensions has been built since (we refer to the French five-master La France); but now Germany has become the possessor of the largest sailing vessel in the world. On June 8, of this year, the five-master Potosi was launched from the yards of Tecklenborg, and a short time ago started on its first voyage to Iquique. The vessel is owned by the well known Hamburg house of F. Laeisz, and its command was given to Captain Hilgendorf, who has made remarkably quick voyages with other vessels built in the Tecklenborg yards and enjoys a very high reputation for ability.

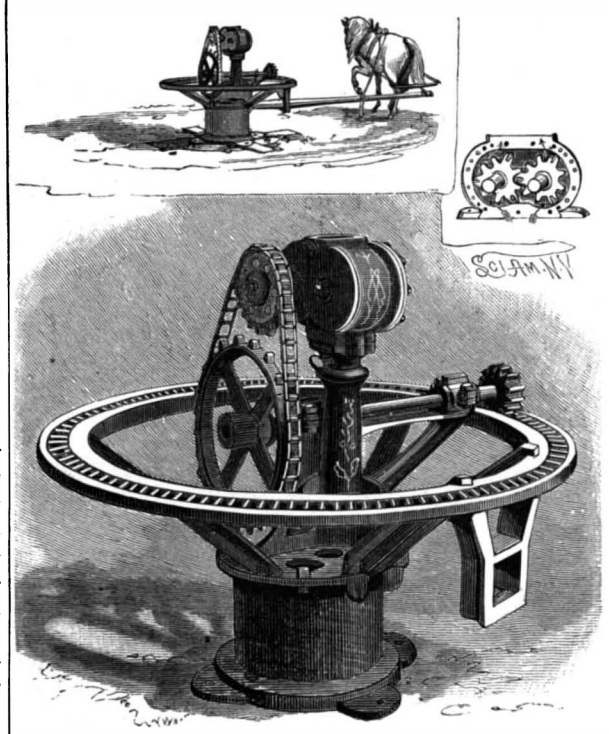
The Potosi is so enormous that other sailing vessels which have been considered large appear like dwarfs beside it. It is about 426 feet 6 inches long, 52 feet 5 inches broad, and 32 feet 9 inches deep. It has a capacity of 6,150 tons, or 550 tons more than that of La France. The uninitiated may obtain a better idea of the great size of this vessel from the following figures: 5,511,500 pounds of iron were used in its construction, and the vessel, which will make regular trips to the western coast of South America for saltpeter, can carry about 13,227 bags of this salt. For the transportation of the same quantity by rail 600 double cars would be required, which, if coupled together, would make a train more than 3 miles long.

The Potosi carries 39 sails that are made of canvas nearly two feet wide, and if all of these pieces of canvas were sewed together they would make a strip nearly one and one-half miles long. The vessel can carry as many people as there are in a city of the size of Bremen.

The Potosi excels other sailing vessels not only in size, but also in the elegance of its construction and fitting. The Maria Rickmers was built in an English yard, but, as we have said, the Potosi was constructed in Germany and is a specimen of ship building of which all Germans may well be proud. May good fortune attend her in all her voyages!—Illustrirte Zeitung.

AN EFFICIENT HORSE POWER AND PUMP.

The illustration represents a simple, strong, and highly efficient horse power and pump, which has been



BEEBE'S HORSE POWER AND PUMP.

in general use on the Pacific coast for the past eight years. It has been patented and is manufactured by R. M. Beebe, of Gridley, Cal. The flanges of the center casing are bolted to timbers over or at one side of a well, and the large gear or master wheel as it revolves sets in motion the pinion shaft and large chain gear which runs the pump, a sectional view of which is shown in the small figure. It comprises a pair of corrugated cams working together in an oval case, the ends of long teeth being packed with blocks of metal inserted in grooves and pressed out by springs, insuring a perfect vacuum and taking up wear. The water enters at the bottom by suction, the stream dividing and filling the chambers made by the long teeth as the cams revolve, and discharging at the top. The rotary motion is steady and continuous, there being no dead points, and the pump may also be used as a force pump to force water to any height or distance from the pump.

The Phonograph Explained Just What Ailed a Big Pump in California.

It appears that the Knowles Pump Works put up one of their large pumps for the Ricks Water Company at the Elk River pumping station in California. The pump was in constant use for some years and the makers heard no complaint until a few weeks ago, when they received a novel communication from H. L. Ricks, the manager of the pumping station.

There was no doubt in the minds of those at the station who were best acquainted with the mechanism that something was wrong with the pump, but they were unable to fix on the defect, and as the dismemberment of the pump would involve much loss of time, and as a visit by an expert from the East would mean a considerable expense, the phonograph was resorted to. The manager spoke into the receiver, describing the symptoms of the ailing pump, and further to indicate the case, he placed the receiver so that the pulsations of the pump would be recorded on the roll.

Just as a physician listens to the action of the heart or lungs in the human body by means of a stethoscope, so the pump doctor listened by means of a phonograph to the throbs and pulsations of the pump thousands of miles away, and was enabled by that means to diagnose the disease.

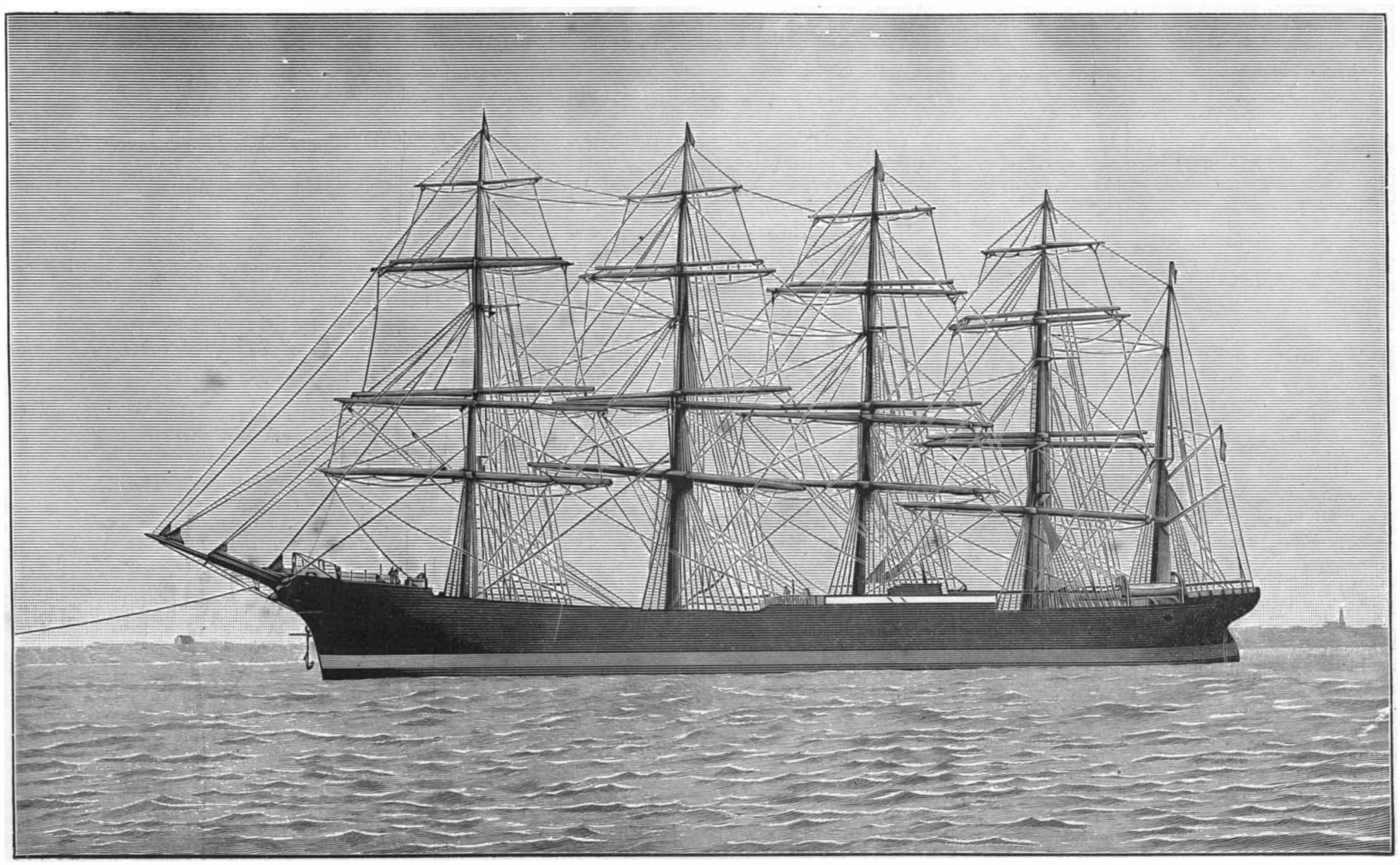
The New York Tribune tells how a reporter listened to the strange communication at the New York office of the Knowles Company. The voice of the Californian is heard first giving in a clear, precise, and distinct way the symptoms of the pump, and then he asks the listener to pay attention to the pump's action. Then one hears the b-r-r-r-bang! b-r-r-r-bang! of the pump and an occasional wheezing sound which might be made by escaping steam.

The engineer to whom the phonograph was submitted said that the whole record was so perfect and the speaking so plain that he felt tempted sometimes to interrupt and ask additional questions.

The experiment proved absolutely successful, and by means of the roll the disease was diagnosed. The proper remedy was suggested, and the pump is running once more "good as new."

Spools.

Practically all the wood used in making spools for thread in this country and Great Britain is cut in Maine forests, but so great is the amount of lumber required each year for the making of these seemingly insignificant articles that Maine will not be able to supply the raw material much longer. The spools are made of birch wood, and the birch of the Maine forests is the best for the purpose. More than two million feet of lumber is shipped to Scotland every year for the use of the great thread manufactories there, and almost as much is supplied to domestic manufacturers. The business began in Maine twenty-five years ago, and land that was cut over at that time is now well covered with young trees, but not for twenty-five years more will this timber be fit to cut.



THE LARGEST SAILING VESSEL IN THE WORLD.

CHARLES VALENTINE RILEY.

It is with deep sorrow we record the death of this distinguished and indefatigable worker in science. In Washington, on the morning of the 14th of September, in company with his son, Prof. Riley started on his wheel for the city from his residence, Wyoming Avenue. They bowled on at a fast rate all along the route, and when the level space was reached at the foot of the hill, where Connecticut Avenue intersects with S Street, the wheels were flying with more rapidity than the careful professor usually attained. Suddenly the front wheel of his machine struck a small rock and twisted completely around. The shock was so sudden that Prof. Riley was thrown violently forward over the handle bars and landed on his head and face. He retained his hold on the handles, however, and the bicycle fell on top of him. He was unconscious when picked up.

A number of physicians were summoned at once, and within a few minutes the sufferer was receiving treatment.

Blood was flowing from the ears, indicating that there was a fracture of the skull. He seemed to be almost at death's door when he was lifted into the ambulance and carried to the home from which he had gone in full health and vigor but a few minutes before. The skull was found to be fractured at the base of the brain. The patient gradually sank, and at 11:50 P. M. life passed away.

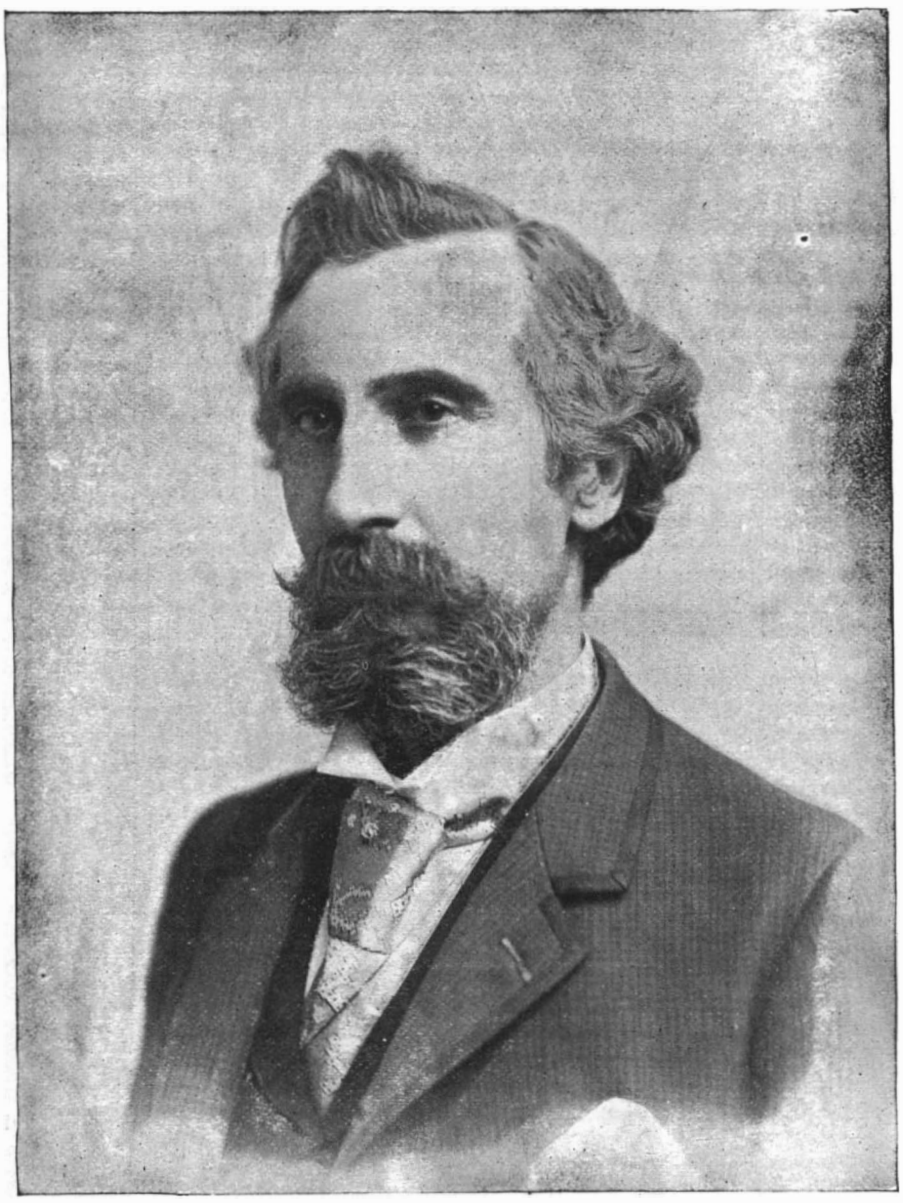
The name of Prof. C. V. Riley is a familiar one to our readers. He appeals to them as the author of some of the most interesting papers which we have published in the SCIENTIFIC AMERICAN and SUPPLEMENT, and many of our readers are under special obligations to him for the work he has done in solving problems in entomology. In the scientific world it may be said that no entomologist stands higher than he. His career is of special interest as showing the typical self-made man whose life is identified with America, and whose first steps, after his school and college days, were taken on the farm and in the sevice of the press.

We cannot do better than repeat here the interesting sketch of Prof. Riley's life and labors given not long ago in these columns.

Charles Valentine Riley was born in London, September 18, 1843. His early life was spent in rural England, much of it in the pretty village of Walton-on-the-Thames, between Hampton Court and Windsor. At the age of 11, he entered the College of St. Paul, Dieppe, France. After three years' attendance there he spent three years more in a private school in Bonn, Prussia.

Even in these early days his talent for drawing was noticeable, and curiously enough, as an indication of the future, he had a great fancy for producing exquisite delineations of butterflies, moths and other insects.

While his drawing teacher, Prof. A. Hoe, was urging him to repair to Paris and devote himself to art, he was by family circumstances thrown upon his own resources, and at the early age of 17 he sailed for America, went West and settled with Mr. G. H. Edwards, Kankakee County, Illinois, on a stock farm.



THE LATE PROFESSOR CHARLES VALENTINE RILEY.

Three years were spent here, years during which the boy was distinguished by his love of work and by a most marked tendency for original research, which took the direction of the improvement of farm processes and of farm stock. Those who know him say that there is but little doubt that he would have made a mark as an advanced agriculturist had not his health failed him under the great strain, so that at the age of 20 years he went to Chicago. Here he had his early trials. He actually worked in a pork packing establishment, made portraits of his fellow boarders and made sketches which he personally sold to appreciative purchasers. At last he obtained an engagement as a reporter on the Evening Journal, and next changed to the Prairie Farmer, at that time the leading agricultural paper of the West. His especial department was botany and entomology, and in the interest of that department he traveled extensively. His enthusiasm, industry and versatility soon made his services invaluable. A curious illustration of the bent of his mind is shown in the fact that he here learned typesetting, simply because he was determined to have some trade at his command. The development of insects was one of his main studies, and the results of many original investigations and the answers to many inquiries were published by him in this paper. In May, 1864, he enlisted in the army, serving for six months with the 134th Illinois volunteers. The regiment disbanding six months later, he returned to his paper, severing his connection with it in the spring of 1868 to accept the office of State Entomologist for Missouri. At last we find him fully launched upon his career, and from 1868 to 1877 he did the work which firmly established his international fame.

His salary was but $3,000 per annum and there was no allowance for expenses, yet out of this amount Prof. Riley paid his assistant and large traveling expenses. He also paid for the beautiful illustrations of the reports, which illustrations were drawn by himself. The original edition of the reports have been long exhausted, and any copies now bring very high prices. Charles Darwin, the famous naturalist, gave them the highest encomiums. In connection with Mr. B. B. Walsh, Acting State Entomologist of Illinois, Prof. Riley established the American Entomologist about this time.

In 1873 a bill was passed creating the United States Entomologic Commission, with Prof. Riley as chief, and Dr. A. S. Packard, Jr., and Cyrus Thomas as his associates. This commission was designed to cope with the Rocky Mountain locust, then doing great damage, and in the five years of its existence published five large, fully illustrated reports, besides seven bulletins, all the work being done by the three members.

Since this period, with an intermission of two years, Prof. Riley held the position of United States Entomologist, which he resigned a few months ago. His work at Washington fully upheld the promise of his early years. In carrying on the operations of his department, working night and day, year after year, without rest, he nearly ruined his constitution. To the National Museum he presented his magnificent private collection of insects, representing the labor of twenty-five years. With it as a nucleus he built up a collection unsurpassed in America.

Applied entomology or economic entomology, as it is sometimes called, was his specialty, and he in some sense was the founder of that science. Space is not at command to even summarize his work. After his studies on the Western locust problem, he took up the animals affecting stock in the lower Mississippi, those affecting the hop industry and cranberry growers, and in all those lines he did useful and practical work, ameliorating greatly the troubles of the farmer.

In the past few years, two of his studies have produced epoch-making results. One is his famous emulsion of kerosene oil, milk or soap solution being the emulsifying agent. Having found that this was an infallible insecticide, he had to devise means for applying it, and invented the "cyclone," "eddy chamber," or "Riley system" of nozzle for spraying it upon trees. Another of his achievements was the introduction of the Australian ladybird, Vedalia cardinalis, into California, to destroy the white scale, which was then ruining the orange groves. The result was simply magical. Since then the insect has been introduced elsewhere. It is interesting to note that other attempts of the same sort that have been made in California, against other insects, either against his advice or without his indorsement, have not had the same success. His discoveries in relation to the phylloxera alone were enough to give him international renown, and his recommendations have been followed by grape growers in all parts of the world. He was a most voluminous writer; a bibliography of his writings, published by the Department of Agriculture, five years ago, showing over 15,000 titles.

It would take much space to give the simple list of the honors in the way of medals and diplomas, honorary memberships of societies and the like which have been showered upon him. One of his greatest honors was the gold medal presented him by France in 1873, in appreciation of his services in the study of the phylloxera. His work will live. His organization of the Entomological Department of the United States government will be responsible for much of its value and utility in the future, and lands as far apart as Egypt, the Sandwich Islands, California and France are to-day reaping the benefits of his work. His resignation from the Department of Agriculture was commented upon as a serious loss, brought about by his absolute need for rest and by other causes affecting his professional work. It was believed that the vacation which he at last gave himself might be productive of the most important results to humanity in the direction of his favorite science.

As a lecturer his reputation was extended. He has held appointments as lecturer on entomology at Cornell University, Kansas State Agricultural College, Missouri State University, and the St. Louis Washington University. He has also lectured before the Boston Lowell Institute and the Brooklyn Institute. He edited the fifth volume of the Reports on the Paris Exposition of 1889, a work of nearly a thousand pages, with text, figures, and plates, a work containing a mine of valuable information on agriculture and agricultural education, not only of foreign countries, but of our own. So much of his writing was in the form of monographs and addresses, and it embraced so many titles, that it cannot be summarized here.

Tons of Force Expended in Playing the Piano.

It is said that it requires more force to sound a note gently on the piano than to lift "the lid of a kettle." We do not know, says the Literary Digest, just what kind of a kettle the German composer who makes this statement means, but he has figured that the minimum pressure of the finger playing pianissimo is equal to a quarter of a pound; and few kettle lids, he says, weigh more than two ounces. The American Art Journal says:

"The German's calculations are easy to verify if one takes a small handful of coins and piles them on a key of the piano. When a sufficient quantity is piled on to make a note sound they may then be weighed, and these figures will be found to be true.

"If the pianist is playing fortissimo, a much greater force is needed. At times a force of six ponnds is thrown upon a single key to produce a solitary effect. With chords the force is generally spread over the various notes sounded simultaneously, though a greater output of force is undoubtedly expended. This is what gives pianists the wonderful strength in their fingers that is often commented on. A story used to be told of Paderewski that he could crack a pane of French plate glass half an inch thick merely by placing one hand upon it, as if upon a piano keyboard, and striking it sharply with his middle finger.

"Chopin's last study in C minor has a passage which takes two minutes and five seconds to play. The total pressure brought to bear on this, it is estimated, is equal to three full tons. The average 'tonnage of an hour's piano playing of Chopin's music varies from twelve to eighty-four tons. Wagner has not yet been calculated along these lines."

The Invisible Spectrum.

Dr. Huggins, in concluding his spectroscopic lectures at the Royal Institution, alluded to the wonderful advances recently made in ascertaining the character of the invisible parts of the solar spectrum. The rays of the sun, when received through the prism of the spectroscope, appear to the eye as a ribbon of rainbow colored light, across which are drawn a multitude of fine black lines, representing the screening or absorptive effect of the solar atmosphere. From the character and position of these lines the spectroscopic chemist is able to say what chemical elements in the gaseous atmosphere of the sun are causing this absorption. But this visible portion of the spectrum compasses but a fraction of the total rays that are speeding to us from the great fountain of energy upon which the life of the earth and its fellow planets depends. Beyond the violet end of the spectrum there is a whole gamut of invisible rays which only revealed themselves by their effect in promoting chemical action. Similarly beyond the other end of the visible scale—the deep red—there is a gamut of invisible or dark rays which are only perceived by their heating effects.

Some idea of the importance of the "ultra red" may be gathered from the fact that it has been traced to a distance nearly ten times as long as the whole range of the visible or light-giving region of the spectrum. To learn the character of these mysterious, dark rays, then, it is clearly necessary for science to fit itself with some new sort of eyes that can see what ordinary eyes cannot, namely, heat rays and chemical rays. The photographic plate has answered admirably as an eye for the chemical rays, and brought out some wonderful facts. But with the invisible heat rays the problem was more difficult. Something in the nature of an extremely delicate thermometer is here required, which will pick out all the fine absorption lines as colder spots in the spectrum. The beautiful instrument known as the bolometer has recently been used by Professor Langley in feeling for these absorption lines, which, being regions from which the rays are stopped out, are, of course, colder than the remainder of the spectrum.

This bolometer, like all the finest applications of science, is an extremely simple thing. It is a strip of fine wire through which a feeble current of electricity is always flowing. This wire is slowly passed along the invisible gamut of the spectrum, and as soon as it comes to one of the absorption lines the spot is shown by a minute fall of temperature in the wire. This has an instantaneous effect on the flow of the electrical current. More current will pass through a cool wire than a warmer one, and the alteration is promptly shown by a delicate mirror galvanometer, which flashes its mimic signals on to a slowly revolving photographic ribbon. In this way Professor Langley has been able to pick out and locate hundreds of dark absorption lines in the great invisible spectrum, which lies beyond the red.

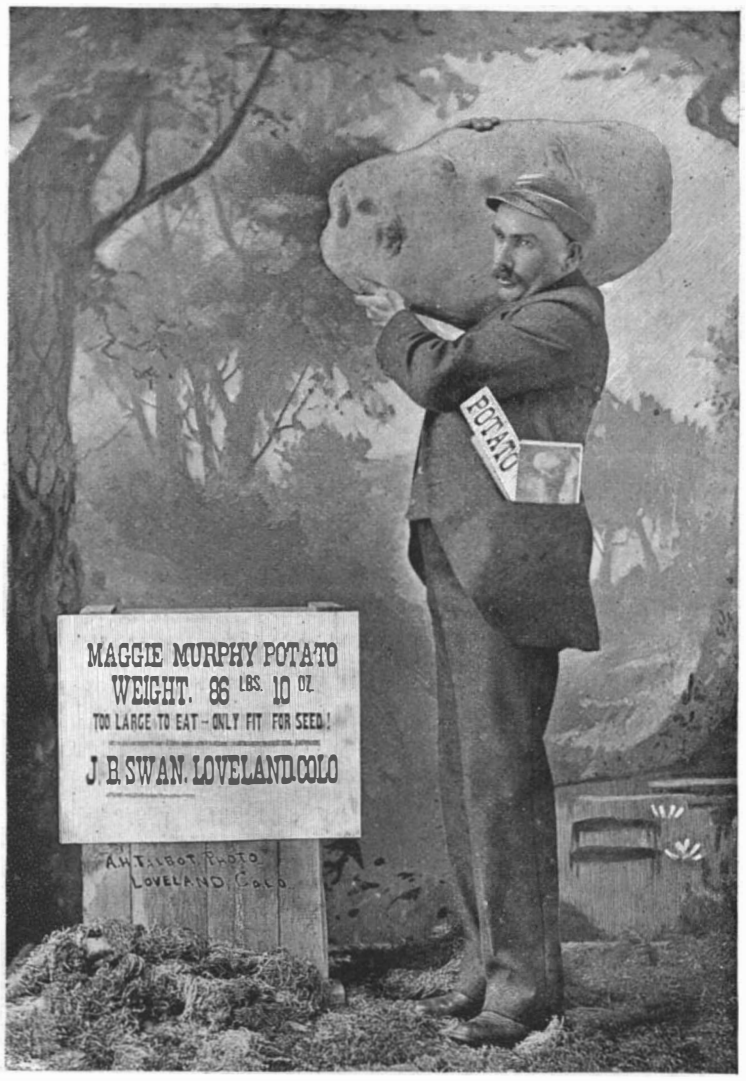
Not only is the absorption of rays by the solar atmosphere shown by the method, but the absorption lines of the earth's atmosphere are equally apparent. Dr. Huggins anticipates that the meteorologist will soon be applying the system to weather forecasts. Some final remarks of the lecturer in regard to the photography of the corona of the sun are of interest as indicating the enormous energy which is at work in the solar furnaces. He stated that fiery spurts of calcium vapor (calcium is the metal of which quicklime is the oxide) have been photographed, extending in fantastic shapes to a distance of 280,000 miles from the sun's surface, and traveling outward at a speed of something like 20,000 to 40,000 miles an hour.

Electricity and the Mails.

It has recently been pointed out that already the telephone is used, by actual count, ten times as much as the telegraph, the annual figures being put now at about 75,000,000 telegrams and 750,000,000 telephone talks. The long distance telephone system is paralleling the older telegraph lines all over the country, and in the cities the average of use of the telegraph, owing to rapid transit, messenger service, special delivery letters, and above all, the telephone, has dropped much below one message per head per year. A suggestion lately put forward by Mr. P. B. Delany, an inventor and electrician of high standing, is the subject just now of warm discussion in electrical circles. Having in mind the statistics quoted above, Mr. Delany announces his firm conviction that it is time to get out of the telegraph its full working value, and that it ought now to be used for the carriage of the mails, not in the physical sense, but literally, all the same. He believes that 40,000 or 50,000 letters of about fifty words each between Chicago and New York could every day be profitably sent over a couple of copper wires at a rate of 12 or 15 cents apiece. Thousands of such letters now pay 12 cents in the mail to insure the saving of half an hour after a journey of twenty-four hours, whereas by Mr. Delany's plan correspondence between two such metropolitan centers could easily be interchanged in an hour and the documents be delivered in clean typewriter print. The plan is based necessarily on "machine telegraphy," which has been on trial before and not gone very far; but the growth of the great cities and the undoubted desire for swifter, cheaper intercommunication of private and public news, give more plausibility to Mr. Delany's arguments than they have had hitherto. His idea is to give the public a low-priced telegraphic mail on the same lines that Rowland Hill first started his universal postal service, and his contention is that the function of railways is to handle passengers and freight, but not anything so intangible as correspondence and news.—The Evening Post.

A MAMMOTH POTATO.

We are indebted to Dumont Clarke, Esq., of this city, for the photograph from which our engraving was made, showing the monstrous size of a potato grown by Mr. J. B. Swan, of Loveland, Col. The photograph was taken by Mr. A. H. Talbot, of the same place. This huge vegetable specimen is 28 inches long, 14 in diameter, and is said to weigh 86 lb. 10 oz., which is equivalent to the weight of 1½ bushels of ordinary potatoes. It is of the Maggie Murphy variety, excellent in quality and prolific in quantity. Last year, from a single acre on Mr. Swan's farm, 430 bushels of potatoes were obtained.



A MAMMOTH POTATO.

The World's Transportation.

Dr. Chauncey M. Depew recently gave a graphic presentation of the land and water traffic of the world last year, from which we take the following paragraph:

"The whole of the tonnage on the oceans of the world last year was about 140,000,000 tons, while the tonnage of the railways of the world, carried 100 miles, was about 1,400,000,000 tons. There are 400,000 miles of railroad in the world, of which 180,000 are in the United States. Of the 1,400,000,000 tons carried 100 miles last year on the railways of the world, 800,000,000 tons were carried on the railways of the United States. You take the 600,000,000 tons carried 100 miles on the railways of the world outside of the United States, and then you add to it 140,000,000 carried on the ocean in the commerce of the world upon the seas, and we still have in the 800,000,000 tons carried on the railways of the United States 6,000,000 tons more than on all railways of the world outside of the United States and in all the ocean commerce of the world put together. This internal commerce of the United States makes it the most wonderful market on the globe."

Scented Oils.

Continental perfumers employ three different processes for preparing these oils. They are as under:

1. A sufficient quantity of the essential oil of the plant, or of the concentrated essence of the substance, if it does not furnish an oil, is added to the fixed oil which it is desired to perfume, until the latter becomes agreeably fragrant; the whole is then allowed to repose for a few days, and, if any sediment falls (which should not be the case when the ingredients are pure), the clear portion is decanted into another bottle. When alcoholic essences are thus employed, the fixed oil should be gently warmed, and the admixture made in a strong bottle, so as to permit of its being corked and well agitated with safety; and in this case the agitation should be prolonged until the whole has become quite cold. In this way all the ordinary aromatized and perfumed oils of the English druggists and perfumers, as those of bergamotte, cassia, cloves, lavender, lemon, millefleurs, neroli, nutmeg, oranges, roses, etc., are made, but those of a few of the more delicate flowers, and of certain other substances, can only be prepared of the first quality by one or other of the processes described below.

2. (By infusion.) Dry substances, after being reduced to powder, or sliced very small—flowers or petals, after being carefully selected, and picked from the stems and other scentless portions—and soft or unctuous matters, as ambergris, civet, or musk, after being rubbed to a paste with a little oil, either with or without the addition of about twice their weight of clean sand or powdered glass, to facilitate the reduction, are digested in the fixed oil for about one hour, at a gentle heat obtained by means of a water bath, continual stirring being employed all the time; the mixture is then removed from the heat, covered up, and left to settle until the next day, when the clear portion is decanted into clean bottles. When flowers are employed, the free oil is drained off, and the remainder obtained by the action of a press. The process is then repeated with fresh flowers, five or six times, or even oftener, until the oil is sufficiently perfumed. For ambergis, musk, or civet, the digestion is generally continued for fifteen to twenty days, during which time the vessel is either freely exposed to the sunshine or kept in an equally warm situation.

3. (By the flowers.)—a. Upon an iron frame a piece of white, spongy cotton cloth is stretched, and then moistened with almond or olive oil, usually the latter; on the cloth is placed a thin layer of the fresh plucked flowers; another frame is similarly treated, and in this way a pile of them is made. In twenty-four or thirty hours the flowers are replaced by fresh ones, and this is repeated every day or every other day, until seven or eight different lots of flowers have been consumed, or the oil is sufficiently loaded with their odor. The oil is then obtained from the cotton cloth by powerful pressure, and is placed aside in bottles to settle, ready to be decanted into others for sale. Sometimes thin layers of cotton wool, slightly moistened with oil, are employed instead of cotton cloth.

The oils of honeysuckle, jasmin or jessamine, jonquil, may blossom, myrtle blossom, narcissus, tuberose, violet, and, in general, of all the more delicate flowers, are prepared in the above manner.

b. The native perfumers of India prepare their scented oils of bela, chumbul, jasmin, etc., in the following manner: A layer of the scented flowers, about four inches thick and two feet square, is formed on the ground; over this is placed a layer of moistened tel or sesamum seeds, two inches thick, and on this another four inch layer of flowers. Over the whole a sheet is thrown, which is kept pressed down by weights attached round the edges. The flowers are replaced with fresh ones after the lapse of twenty-four hours, and the process is repeated a third and even a fourth time, when a very highly scented oil is desired. The swollen sesamum seeds, rendered fragrant by contact with the flowers, are then submitted to the action of the press, by which their bland oil is obtained strongly impregnated with the aroma of the flowers. The expressed oil is then set aside in dubbers (bottles made of untanned hides) to settle.

c. The flowers are crushed in a mortar or mill, with one-half their weight of blanched sweet almonds, and the next day the mass is gently heated and submitted to the action of a powerful press; the liquid thus obtained is allowed to repose for a week, when the upper portion of oil is decanted and filtered. This plan is occasionally adopted in this country for the oils of roses and a few other flowers.

FIFTY-ONE per cent of the foreigners in England live in London.

INTERNATIONAL YACHT RACES OF 1895.

We present herewith a characteristic picture of the American yacht Defender as she appeared on the homestretch, with the excursion fleet attending her, at the close of the third race of the 1895 series, which took place on the 12th inst. It is a matter of history how she won the first race by a handsome margin; the second by the verdict of the club she represents; and the third by virtue of the fact that no sooner had her opponent crossed the line than she folded her wings and signaled her convoy, asking to be taken home again. This strange maneuver of the Valkyrie, instantly stripping the race as it did of all interest, came like a thunderclap upon the 20,000 people that were watching the start with an absorbing interest. It was a striking spectacle. That vast semicircle of yachts and steamships lay motionless and silent for fully ten minutes, as if dumbstruck with amazement at this unheard-of proceeding—a proceeding without a parallel in the annals of international yacht racing. Then, slowly, it split into two separate fleets; one-half hurrying homeward in disgust and disappointment, and the other, moved by a patriotic sense of duty, starting off to give the customary salute at the turning point and again at the home mark. Later in the day they learned that the Valkyrie drew out of the race because the committee had refused to impose fresh conditions for the government of the races at the eleventh hour and had failed to guarantee a course that should be absolutely free from interference by the excursion boats.

The demand by so experienced a yachtsman as Lord Dunraven for the imposition of fresh conditions in the midst of a series of races is so extraordinary and impossible as to warrant the conclusion that this was merely a diplomatic method of acknowledging his defeat.

The foremost steamer in the picture illustrates very truthfully the crowded state of some of the boats. Such was the interest in these races that people willingly paid their $5 for the privilege of nearly twelve hours' imprisonment within these boats, that in many cases were crowded to suffocation.

In the face of enthusiasm such as this, it sounds almost like an insult to suggest the sailing of these races "far from the madding crowd." The public believes that it has rights in the matter of viewing these races. They certainly have; and their right lies in that strong color of internationalism which the holders of, and challengers for, the cup have themselves ever given to these contests.

AN inch of rain falling upon an area of one square mile is equivalent to nearly 17,500,000 gallons, weighing 145,250,000 pounds, or 64,844 tons.

Silvering Glass.

We find the following in Popular Astronomy:

An ordinary coating of silver on glass is between one and two hundred thousandths of an inch thick, and if the deposit is a perfect one, will always transmit blue light.

Dr. Draper found the silver on his mirrors to be about one two hundred thousandths of an inch thick when they transmitted the blue light freely.

The coating can be made thicker without difficulty, but it is of little use to make it opaque, as it will absorb the blue or short waves, no matter how thick it is, besides which, there is a danger that the silver may deposit in unequal thickness, indeed, will always do so if the surface of the glass has not been thoroughly and equally cleaned.

This unequal thickness of silver will of course impair its optical value. A thicker deposit of silver can be obtained by using larger quantities of the chemicals, in the same amount of water, but a better way is to prepare two baths, and when the first coat has deposited, immediately immerse in the second bath. Of course the reducing solution must not be put into bath No. 2 until the mirror is ready to be placed in it. Considerable skill is necessary to second coat a mirror, for if any spot becomes dry in the interim of transferring from the first to the second bath, that spot will not silver as thick as the parts kept wet. If too long in the second bath, the silver will bleach; hence it is the safer plan to lift mirror out of bath before all the silver is down.

The electrical method of silvering specula is mostly used in Germany, and is not yet perfected, being adapted to small mirrors only, the silvering being done in vacuo.

The mirror is placed in a horizontal position in a glass receiver. Over the mirror and very close to the surface a thin plate of silver is hung to a wire which in turn is connected to a powerful Ruhmkorff coil or other means of sending a strong current through the wire.

The air is then exhausted from the vessel and the current sent through the wires. Professor Wright uses a small piece of silver and keeps it swinging over the glass to be coated.

So far this method is found a very difficult one for surfaces over two or three inches diameter, and is not at all suited for the general use of silvering specula for reflecting telescopes; besides which there is no difference in the silvering, except that in the case of chemically deposited silver a slight "patina" or bloom is left on the surface, and must be polished off, while in the case of the electrically deposited silver no polishing is necessary, hence no microscopic scratches.

There is one advantage in electric deposition, and that is, almost any metal may be deposited on glass. The writer has seen many beautiful specimens in Professor Wright's laboratory, of such metals as gold, platinum, iron, copper, etc., deposited on glass.

All the delicate mirrors made for Professor Langley have been coated with platinum by the electric process.

Ang-Khak, a Chinese Fungoid Pigment.

BY H. C. POINSEN.

This coloring matter is imported into Java from China, for giving a fine purple color to foods and beverages. It is the product of a special fungus which is propagated in the province of Quant-tung for preparing the coloring matter. Rice, thoroughly boiled, is spread out upon plates to cool, and when quite cold is sprinkled over with ang-khak of a former preparation. The plates, with their contents, are then kept for six days in a dark, cold place. It then has a red color, which afterward becomes darker.

In what manner the Chinese obtained the first ang-khak fungi is unknown. The coloring matter dissolves readily in alcohol with a splendid garnet-red color. The fungus belongs to the group of the Telebolæ. It vegetates upon any kind of carbohydrate in the presence of oxygen. The chief difficulty in its preparation is to keep away other fungi and bacteria, especially a species not yet examined. This is effected by means of a trace of arsenic, which prevents the growth of other bacteria without interfering with the development of the ang-khak.

The coloring matter can be extracted with chloroform. In a state of purity it dissolves in methyl and ethyl ether, glacial acetic acid, aceton, and ethyl acetate, but very sparingly in water and dilute acids, and not at all in benzine, petroleum ether, oil of turpentine, carbon disulphide, and glycerine. It melts at 50°, and at a strong heat it is decomposed without subliming. The alcoholic solution displays a narrow absorption band at D, and a broad band in the blue between D and G. The coloring matter behaves like most of the aniline colors, but it is distinguished by its precipitability with mercuric oxide.

The manufacture of ang-khak is probably the first instance of the technical use of microbia.—Chemiker Zeitung.

THE statistical summary of vessels totally lost, condemned, etc., published by Lloyd's Register, shows that during 1894 the gross reduction in the effective mercantile marine of the world amounted to 1,154 vessels, of 708,971 tons, excluding all vessels of less than 100 tons.

THE INTERNATIONAL YACHT RACES OF 1895—THE DEFENDER ON THE HOMESTRETCH

PENNSYLVANIA COAL MINING.

(Continued from first page.)

In Fig. 3 the plan is somewhat different. The coal, sliding from gates in the two main shutes into short cross shutes, is picked and discharged into a shute beneath the central or slate shute, the boys having to toss the slate into the central shute, which discharges into a carrier to the waste heap. The constant watch of the gang bosses keeps the boys steadily at work, for a moment's let-up means so much slate or stone carried into the marketable coal, or, if the feed shutter is closed, the feed shute soon banks up and the screens must stop running. Fig. 4 is a general view of the Bast colliery, showing the hoisting shaft housing, shutes, and the breaker house on the left. In front is the timber yard, a large stock at ready hand being necessary for the props and other timbering of coal mines, which requires frequent renewing.

The Camera in the Rockies.

BY H. H. BUCKWALTER.

Colorado and the Rocky Mountain region is visited annually by thousands of amateur photographers, the great majority of whom get very ordinary results, mainly on account of over-exposure. As the number of "tourists" during this summer will probably be larger than ever before, a few suggestions may not be out of place. In the first place, don't leave your camera at home, for the very scenery which attracts the eye the most is not to be found in the regular stocks of photographs, for the reason that only the places which have been well advertised are greatest in demand.

Regarding the greatest cause of failures, it should be remembered that a clear day in the Rocky Mountain region is considerably clearer than in or near the large cities of the East, where the atmosphere is not only laden with smoke, but fog and haze cut off the light and give it a yellow tint. Besides, at an altitude of a mile or more above the sea level the air is considerably less dense. Therefore, when in the mountains it is well to either increase the speed of the shutter or use a smaller stop in the lens, holding down the light which reaches the plate. For ordinary landscapes the latter method is probably to be preferred, on account of the increase in the definition.

On account of the rarity and clearness of the air, distance in landscapes must be taken into consideration. A landscape with a background of mountains one or two hundred miles away is by no means unusual. If possible orthochromatic plates should be used. In these a substantial advantage will be noticed. On account of the actinic light a slower plate than usual may be employed, and a greater amount of color sensitiveness obtained. There seems to be no question as to the increase in color sensitiveness in the medium speeds of plates. In addition to the distance, there is another feature which renders the use of these plates desirable. In nearly all the canons and gorges, the rocky walls are highly colored; in fact, the whole general features of the mountain regions are highly colored. In Platte Canon, for instance, there are several points where the bottom of the canon is occupied by the foaming, rushing waters, fringed with grass. The wall rocks are colored from a light yellow or sometimes slate at the bottom to a dark red at the top; broken, jagged and a thousand feet or more above. In the most inaccessible places on these cliffs, trees seem to be growing out of the very face of the rock, though in reality in crevices where a few clods of dirt have lodged. Above all this mass of color and form is the bluest of skies. In the afternoon magnificent cloud effects are generally obtainable. With all these in the picture as seen by the eye, the best orthochromatic gives little idea of the natural.

Very few visitors to the West miss trips through the mountains, and it is surprising how much can be seen in an extremely limited time, and likewise with very little outlay financially. It is possible to make several trips of a day each into the mountains, and on each to get into a different class of scenery, though any will give a general idea of the Rocky Mountains.

Just west of Denver there are two canons, either of which may be gone through in a day. Clear Creek Canon is sixty miles long, and every mile gives a change in the general scenery. For the first twenty miles the name does not seem to be very appropriate, for the creek is muddy with the waste of dozens of gold and silver concentrating mills along its course. At the western end of the canon is situated a remarkable piece of railroad engineering known as "The Loop," only one of similar nature existing elsewhere in the world. The distance between the last two stations of the road, Georgetown and Silver Plume, is about a mile and a quarter in a direct line, but the road winds around the sides of the narrow gulch, passing over itself at an elevation of over 100 feet at one point and making the railroad distance between the two towns about five miles. At the same time a rise of 1,000 feet is made. The canon being so narrow, the builders were compelled to adopt this surprising method in order to avoid impossible grades.

The town of Silver Plume furnishes a number of interesting subjects. It is a silver mining community, and is quite a novelty to many. The immense building at the mines and the wire rope tramway bringing ore from mines thousands of feet above, are generally interesting. Occasionally a burro train is seen on the winding trails running up the mountain side. These little animals, about twice the size of large dogs, are loaded with boxes and sacks of ore which make a pile about as tall as themselves. An ancient, gray whiskered animal generally leads the procession, which marches in single file. Sometimes they are loaded with boxes having painted on the outside the single word "Dynamite," indicating that should one of the little beasts fall over "the grade," it would be useless to look for remains.

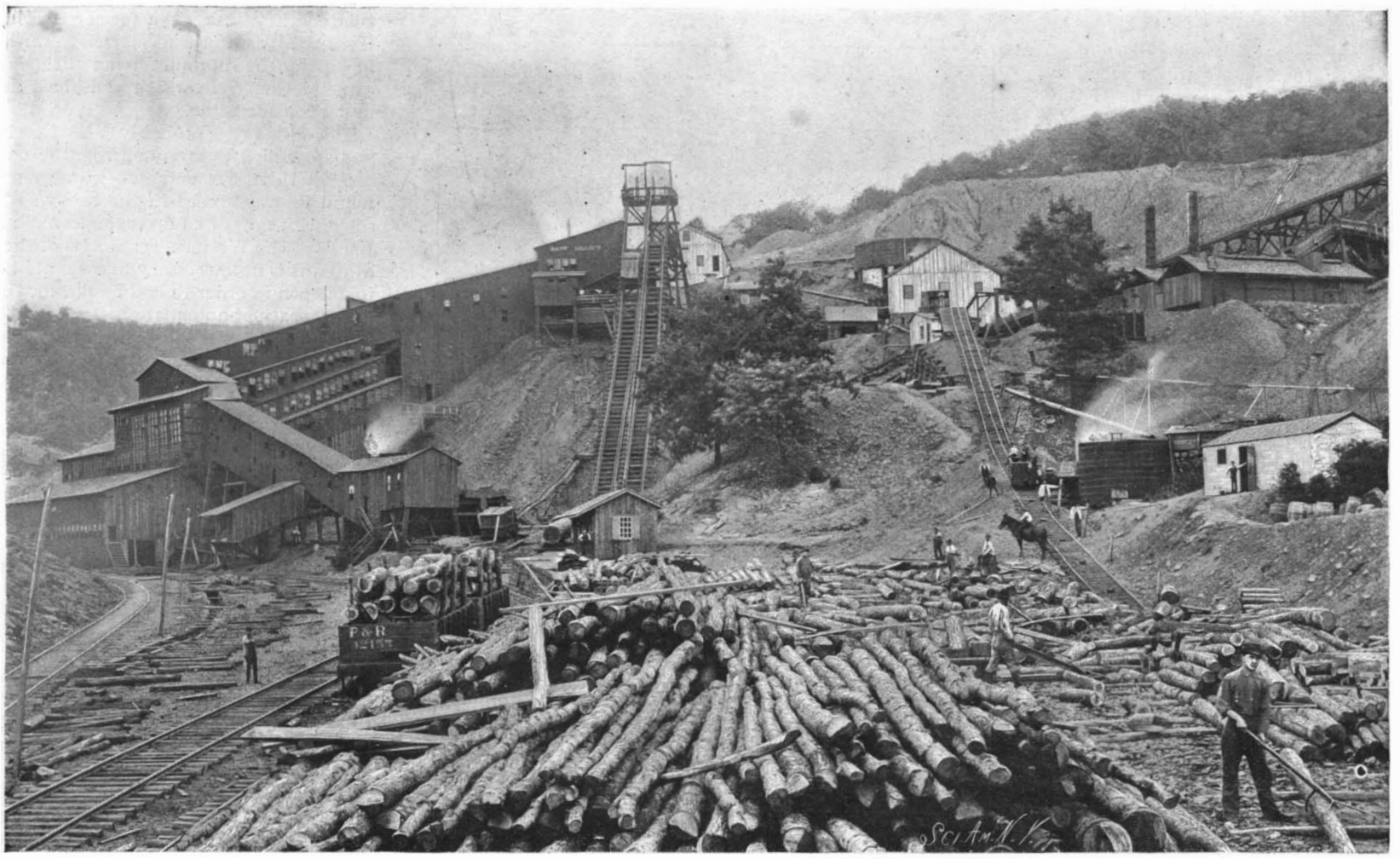
A branch of Clear Creek Canon leads to the double towns of Black Hawk and Central City, gold mining communities and containing in their vicinity some very large and deep gold mines. Access to these is very easy, permission being readily granted by the persons in charge. A few flash cartridges will enable a trial at underground photography, though too much in the line of results should not be expected without having some experience in regular flash light work, as it is somewhat difficult work.

Platte Canon is also a few miles west of the city. The canon is the source of the river made famous by frontier stories, the South Platte. Through this canon, also, Leadville is reached, requiring at least three days to visit and get pictures. A very pleasant day's trip can be made, however, by running up through the canon to where a magnificent view can be obtained of South Park. It may be explained that these parks in the Rockies are immense level areas, lying between the mountain ranges, and in summer they are veritable garden spots and truly named parks.

On the trip to Leadville, two "passes" are crossed, though several small mountains are gone over which appear to be quite elevated. Just before reaching the town of Breckenridge, Argentine Pass is crossed at an elevation of 10,000 feet. Then the train winds down the mountain side and through a number of frontier mining camps, until the trip is begun over "Fremont Pass." At an altitude of 11,300 feet Climax is reached—the crest of the continent. Water from a little spring flows both to the Atlantic and the Pacific. From Climax the road winds around the sides of the mountains thousands of feet above a perfect gem of a valley, until it suddenly turns and enters Leadville through a side gulch.

Dozens of other trips can be made, but most of them are familiar to readers of guide books. Among them may be mentioned Manitou and the Garden of the Gods, with hundreds of other points of interest in the immediate vicinity of these. A very pleasant way to visit these points from Denver is to take a morning train to Colorado Springs, and then electric cars to Manitou, returning to Colorado Springs through the Garden of the Gods by carriage or on foot.

In conclusion the writer strongly urges upon all who visit the Rockies to take a camera of some sort. The additional trouble will more than be well paid by the magnificent additions to private photo collections which may be obtained.—Photo-American.



PENNSYLVANIA COAL MINING—THE BAST COLLIERY.—Fig. 4.

A Drift Wood Jam.

We are indebted to Prof. A. L. Russell, of the Chillicothe Normal and Business College, of that city, for a photograph of the drift wood jam which within the short space of thirty-six hours formed at the C., M. & St. P. RR. bridge over Grand River, about three miles from the above city.

The jam covers a space estimated at over nine acres, and the drift lies from twelve to twenty feet deep, completely bridging the river. It is a tangled mass of logs, sticks and tree branches. The bridge was moved eight inches out of plumb by the pressure of the mass, and one of the section hands was drowned while endeavoring to keep the channel clear.

Our correspondent says the railroad company offer $1,500 to any one who will clear out the drift and free the channel, for a rise in the river means certain destruction to the bridge.

Perils of the Matterhorn.

About thirty years ago the Matterhorn was for the first time successfully ascended by man, so far as is known. A dreadful accident attended that ascent. The party consisted of seven men, led by the famous Alpine climber, Edward Whymper, four of whom were lost. This was Mr. Whymper's ninth attempt to ascend. The thrilling description which Mr. Garrett P. Serviss gives of this occurrence, in McClure's Magazine for September, works one up to the proper mood for hearing the narrative of his own hazardous climb, about a year ago. Passing over the preliminary obstacles, we launch the reader, says the Literary Digest, from which we copy, at once upon the dangerous trail of the adventurous climber:

"Higher, we left the face of the mountain and got upon the crest of the arête. Here were places where one had to balance himself carefully, while the fatigue resulting from the constant use of every limb did not, to say the least, increase one's control over his muscles. It is a simple matter to stand on a ledge only a few inches broad, when it is near the ground; but put your ledge above cloud level, get up upon it out of breath, let void space yawn round your feet, and recollect that it is only the friction of your fingers against the projecting rocks beside you and above your head that retains you where you are, and you will find that a very entertaining metaphysical element has entered into the problem of how to keep the center of gravity within the base. 'Where is the worst place?' I inquired several times. 'Not yet, not yet,' was the reply; 'the Shoulder is the worst.'

"Every visitor to Zermatt will remember seeing a curious knob near the middle of the upper part of the Matterhorn, which appears to project from the side of the mountain, being dark underneath and white with snow on top. The guides call this the 'Shoulder.' It is a fearful spot. We approached it by ascending a steep slope of snow resting upon ice which, in turn, lay upon rock that seemed too smooth to hold it. Having clambered upon the end of the Shoulder overhanging the tremendous precipice seen from Zermatt, we were compelled to turn to the left, for ahead of us everything dropped out of sight. This maneuver brought us upon something that I can only describe as a great knife edge of the mountain, rising sheer out of precipitous depths, and connecting the arête we had just quitted with the main mass of the upper part of the peak. This marvelous ridge, which is also a portion of the Shoulder, is composed of broken rock cemented with ice, and tipped with scallops of snow as translucent as porcelain and beautifully moulded by the wind. The rock on the top was in some places but a few inches wide, and the hard snow capping it ran to a sharp edge, and had frequently to be broken off in order to make room for the hands and feet. Sometimes on my feet, sometimes on hands and knees, and sometimes astride, I got across."

One of the perils of the Matterhorn comes from falling rocks. This danger is spoken of by Mr. Serviss in his account of nearing the summit. Of the falling rocks he says:

"Starting high aloft, they can find no stopping place. Their first touch is like the crack of a gun; the second is an explosion. In great parabolic curves they leap and soar until they burst into shivers. There is nowhere so magnificent an object lesson in the law of gravitation as that presented by these falling stones of the Matterhorn. Above the Shoulder we came upon one of the most perilous localities for falling rocks, and hurried over it, yet none fell while we were there. More than once, when, completely out of breath with the unaccustomed exertions I had put forth, I begged for a moment's respite to recover my wind, the guides would not allow a pause, saying that a shower of stones might assail us at any instant. . . .

"The arrival on the summit was as sensational an experience as any one could wish for. We had got upon another spindling ridge as narrow as that at the Shoulder, and pieces of its frostwork cornice fell at a touch and shot downward in a manner that made one exceedingly careful of his footsteps. The precipice under this ridge, on the left hand side, was not merely vertical, it absolutely overhung; and the necessity of caution kept my attention fixed upon the work immediately in hand, so that before I was fully aware how near we were to the end I suddenly heard Taugwalder shout, 'The top!' 'Yes, monsieur; the top!' called out Garven behind me. I took three steps, and another would have sent me whirling six thousand feet down into Italy!"

Mr. Serviss says that even the most experienced guide cannot enter lightly upon a descent from the Matterhorn, and that for a beginner the mere idea of going down some of the places ascended is a thing to be banished from the mind as quickly as possible. The cheerfulness of the situation was not enhanced for him by the fact that during the latter half of the climb he had been suffering from "mountain sickness," which he says is as hard an ill to bear as seasickness, but luckily it does not affect the head, or did not in his case. He thinks if it had done so he should have been unable to proceed, "for on the Matterhorn vertigo is entirely inadmissible. If you cannot stand unmoved with your toes over the margin of a precipice, you have no business there." And now for the descent:

"Carefully treading once more the snow-topped ridge, we began the descent. Its worst feature immediately became manifest; the eyes could no longer avoid the vacuity that gaped beneath us. Taugwalder, in virtue of his greater experience, now assumed the last place, where he could lend the most effective aid if a slip occurred; I remained in the middle and Graven led. Constant vigilance was the price of life. Theoretically, and I believe practically as well, the rope by which one is fastened to his guides is an assurance of comparative safety for all three; yet there were many points where I could not help wondering whether, if I should slip, Taugwalder, man of iron though he was, would not come tumbling after me, and where I was morally certain that if one of the others fell, I should go along with him into the depths. Fortunately there was no test case; I did not make a misstep or a slip at any critical point. In the most dangerous places only one person moved at a time. The leading guide went on until he was so placed that he could get a good grip on the rocks, or a safe hold with his ice ax. Then I followed and took his place, while he pushed on to another holding, and then the last man joined me, and it became my turn to move again.

"It was with a peculiar sensation that one approached the verge of a precipice and, turning on his face, began to let himself down backward, feeling with his toes for ledges that he could not see, and that might not exceed a fraction of an inch in width, but to which he must entrust as much of his weight as his fingers, clutching similar projections above, were unable to support, while with one leg dangling he reached down for another precarious foothold. And whenever he glanced between his body and the rock to see what his feet were about he caught a thrilling glimpse of precipice below precipice and crag under crag, whose plaything he would become if his head dizzied, his eyes swam or his muscles refused instantly to perform their whole duty. Such are some of the joys of the Matterhorn! I do not say it mockingly; I am giving a record of psychological impressions, and these things, like any mastering of human weakness, are a joy in recollection. Burke proved that terror is a source of the sublime, and sublimity is certainly a source of joy."

Mr. Serviss states that the work of descent was not as exhausting to the physical forces as that of ascent, but it was a heavier tax on the nerves.

OF seventy deaths from lightning in France last year, sixty occurred in the mountains of the department of Puy de Dome.

THE GIGANTIC BIRDS OF SOUTHERN PATAGONIA.

Our readers have perhaps not forgotten the restoration of the æpyornis by Mr. Oustalet which we published not long ago. We now propose to discuss some other extinct birds, more monstrous still, whose fossil remains have recently been discovered in the tertiary strata of Southern Patagonia.

These great birds, like those of Madagascar and New Zealand, were incapable of flying, but they differed much in their organization from the dinornis and æpyornis. The latter, like the ostriches and cassowaries, had a head and bill relatively small for their size. The gigantic birds of Patagonia had, on the contrary, a huge and strongly hooked bill (a true vulture's bill), so much so that they might lay better claim than the æpyornis to be identified with the celebrated roc of the Arabian Nights, if it could be admitted for an instant that the authors of those legends had seen anything of this fabulous bird but the eggs, which are undoubtedly those of the æpyornis.

The geological strata from which Messrs. Carlos and Florentino Ameghino obtained these curious debris are the most ancient of the tertiary series in Patagonia. This region is now a desert, devoid of arborescent vegetation, and so destitute of water that explorers are forced to go to seek this precious liquid at a distance of twenty leagues and to carry it upon mule-back. The landscape, as in all Southern Patagonia, is, despite the absence of forests, very picturesque by reason of its broken aspect, which makes it resemble a country in ruins. Everything indicates that this country was, at a former epoch, deeply furrowed by water that flowed toward the sea, in consequence of an uplifting of the land that exposed the strata which contained the fossils under consideration.

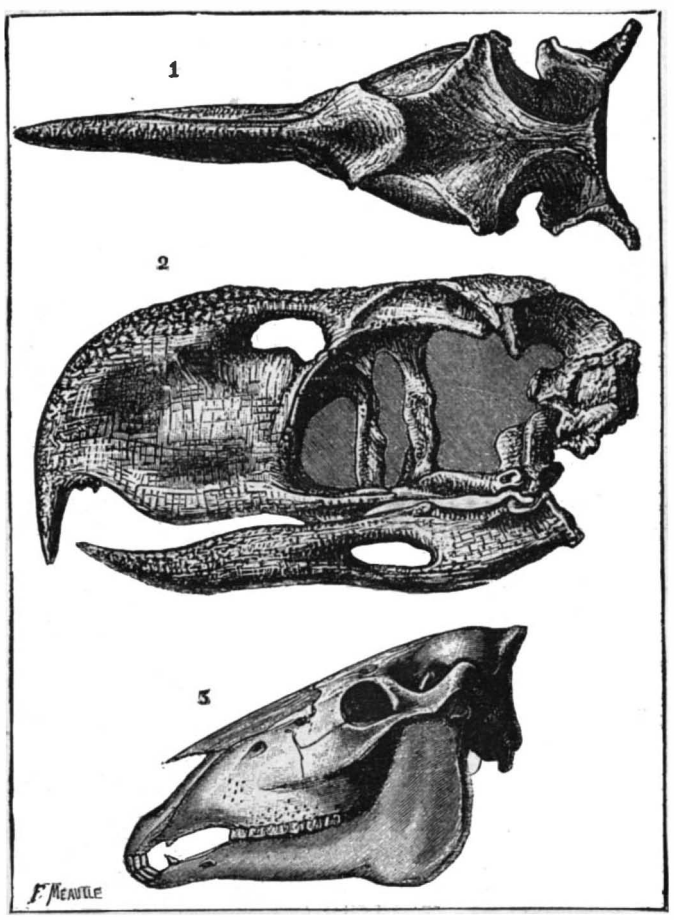


FIG. 1.—Skull of the Phororhacos longissimus seen from above (1) and laterally (2), and reduced to one-eighth natural size. 3. Skull of a horse on the same scale.

These strata are probably of the Eocene epoch and are called Pytherium, from the name of a large herbivorous mammal whose remains are found in abundance in the sandy and friable soil of this now dried up region. As in the Bad Lands of the Western Territories of the United States, it is not necessary to excavate the earth to a depth in order to find fossils, for the bones of large extinct animals are often found exposed upon the side of the declivities that border the road followed by travelers, and offer an easy booty to the paleontologist who may know their value and who for the first time travels over this wild country.

It was thus that Mr. Ameghino was enabled to collect the valuable remains that permitted of reconstructing a fauna that long ago disappeared. Some crania, some broken bills, some wing bones and some legs, often almost intact, give us an idea of the strength and proportions of these great birds. More than fifteen species of various sizes have been described.

The Phororhacos inflatus is the best known species. Of this we have an entire skull, with its lower mandible, the bones of the legs and wings, the pelvis and some of the vertebræ of the neck and tail. Although it is not the largest species, it merits a few words, since a study of its characters gives us quite a clear idea of its organization and habits.

The bill is remarkably thick vertically and very much compressed laterally, like that of the rapacious birds. The hollow that precedes this hook presents two small teeth. If we compare this bill with that of our present birds, we shall have to set aside the vultures and other rapacious birds, all of which have well developed wings, and also the balœniceps and the caneroma, whose wide and depressed bill resembles that of the phororhacos only in the terminal hook. But there is one bird not long extinct that exhibits undoubted affinities with the latter, at least by the form of its bill; we refer to the Didus ineptus, a large bird incapable of flight, which was still living on Mauritius Island during the course of the seventeenth century. This bird attained the size of a swan, but was of much heavier build. It is said that it fed upon vegetable substances, such as fruits and roots. It was a stupid animal and a poor runner, and this explains its rapid destruction, beginning from the time at which the Mascarene Islands were occupied by the Dutch in 1598. Less than a century afterward the species was completely extinct.

Although the phororhacos resembled the didus in its bill, it differed from the latter in the form of the pelvis, which was much narrower than that of the didus, and which indicates a lighter bird. In this respect the phororhacos more closely resembled the aphanapteryx or "snipe-billed red hen," which lived on Mauritius Island at the same epoch as the didus, and which, like it, is extinct. The aphanapteryx belonged to the group of rails and had an affinity especially with the ocydromes of New Zealand. Its bill resembled that of the courli and the ibis, and its size was less than that of the didus.

The skull of the phororhacos is 14 inches in length, while that of the didus is but 10. A comparison of the

limbs proves that the form of the phororhacos was not so squat as that of the didus, and was more comparable to that of the aphanapteryx. The measurements of the leg of the didus are as follows: femur, 6·5 inches; tibia, 9·5 inches; tarsus, 5·5 inches; altogether, 21·5 inches for the entire limb; while the phororhacos' leg measured as follows: femur, 9 inches; tibia, 16 inches; tarsus, 12 inches; in all, 37 inches.

The sternum of the phororhacos is not known, so that it is impossible to say whether it was carinate like that of the didus, as seems probable, or flat and shield-shaped like that of the æpyornis. The feet have four toes, as in the didus, and the caudal vertebræ come to a point, as in the reptiles, instead of terminating in a tubercle giving attachment to the powerful muscles of the tail in all the birds that have this organ well developed. The bones of the phororhacos did not possess any cavities filled with air, but were filled with marrow like those of mammals. The bird was of an imposing stature and was comparable to the ostrich, but more robust. Another species of the same genus, the P. longissimus, reached greater dimensions.

The skull of the last named species was 26 inches in length, a size that that of few mammals reaches at the present epoch. The skulls of the horse, camel, and giraffe are much inferior in this respect. It was, says Mr. Ameghino, the most formidable bird's head that could be imagined. The form is that of the preceding species, but with proportions a third larger. The bones of the leg indicate an animal little inferior to the Aepyornis ingens. The leg bones of the latter, according to Mr. Oustalet, measured as follows: femur, 13 inches; tibia, 25·5 inches; metatarsus, 16·75 inches; say altogether, a leg about 55 inches in length. These measurements are approximate and are based upon a comparison of the bones, partly broken, with those of the preceding species. The toes, of which all the phalanges are known, are extremely large, that of the center being more than 10 inches in length, and its ungual phalanx alone measuring 2·5 inches in a straight line. This is strongly curved and pointed, and the basilar tubercle forming a heel is greatly developed — characters that are found again in the didus, and indicate a poorer runner than the æpyornis and the dinornis.

If the phororhacos cedes a little, as to stature, to the æpyornis, the Brontornis Burmeisteri, of which it remains for us to speak, was certainly the most colossal of all the birds known. It was much more massive in build than the phororhacos. The bill, while possessing the same form, was shorter, wider and thicker vertically. The leg was really monstrous, as is shown by the following dimensions: femur, 16 inches; tibia, 30 inches; metatarsus, 17 inches; in all, 63 inches for the height of the haunch, say 9·5 inches more than the Aepyornis ingens. This bird must have been more than 13 feet in height. The shaft of the femur was 3 inches in diameter and the head of this bone measured no less than 7 inches. The toes were shorter and more massive than those of the phororhacos and the ungual phalanges were much wider, flatter and less pointed, like those of running birds. The ungual phalanx of the median toe was 2·5 inches long and 2 inches wide at the base. These characters indicate habits somewhat different from those of the phororhacoses. What were the habits of these large birds, so remarkable by reason of their strong hooked bill, so different from the short and conical bill that characterizes the æpyornis and dinornis? We know that the diet of the latter was almost exclusively vegetable, like that of the ostriches and cassowaries, but, when it concerns the phororhacoses and the brontornises, it is difficult to admit that this powerful bill could have served only for pulling up roots and breaking branches of trees.

It is asserted that the didus fed upon plants solely, but the habits of this so quickly exterminated bird are scarcely known to us except from the stories of sailors who are ignorant and but slightly observant of things relating to nature. It is more probable that this large bird was omnivorous and fed indifferently upon fruits, roots, mollusks and reptiles.

Such must also have been the diet of the wingless birds of Patagonia, several species of which do not exceed our swans or the marabouts of Calcutta in size. What confirms this hypothesis is that Mr. Ameghino has found upon the skull and bill of the phororhacoses certain exostoses and distortions that can be nothing but the trace of deep wounds cicatrized by a deformed callosity. These birds, says Mr. Ameghino, were true ferocious beasts that engaged in frequent battles. It may be admitted, too, that these powerful bipeds did not fear to measure their strength with reptiles of large size.

The paleontological researches made by Messrs. Ameghino and Moreno teach us that, at the end of the cretaceous epoch, the reptiles, and especially the dinosaurians, were abundant and varied in the south of Patagonia. Mr. R. Lydekker has described their remains under the names of titanosaurus and argyrosaurus. It is even probable that this point of the globe is the last in which these gigantic reptiles, so flourishing in the jurassic epoch, had representatives before becoming extinct forever. Like the balœniceps of the present epoch, which destroys many young crocodiles upon the banks of the White Nile, and like the serpentary of southern Africa, which makes bloody war upon snakes, and which is the only running rapacious bird known, the phororhacoses must have given chase to reptiles, which their long legs allowed them to pursue into the swamps. Seizing such reptiles with their strong claws, they must have killed them with strokes of their bill in order to devour them afterward at their leisure, when another bird of their own species did not come to dispute such prey with them. The brontornis must have preferred dry ground, as is shown by the conformation of its toes, the nails of which must have become worn by walking, as in the case of the ostrich.

If we suppose that these large birds already existed in the cretaceous epoch, as seems probable, it is not rash to believe that the phororhacoses and the brontornises did not remain strangers to the extinction of the dinosaurians of Patagonia.—La Nature.

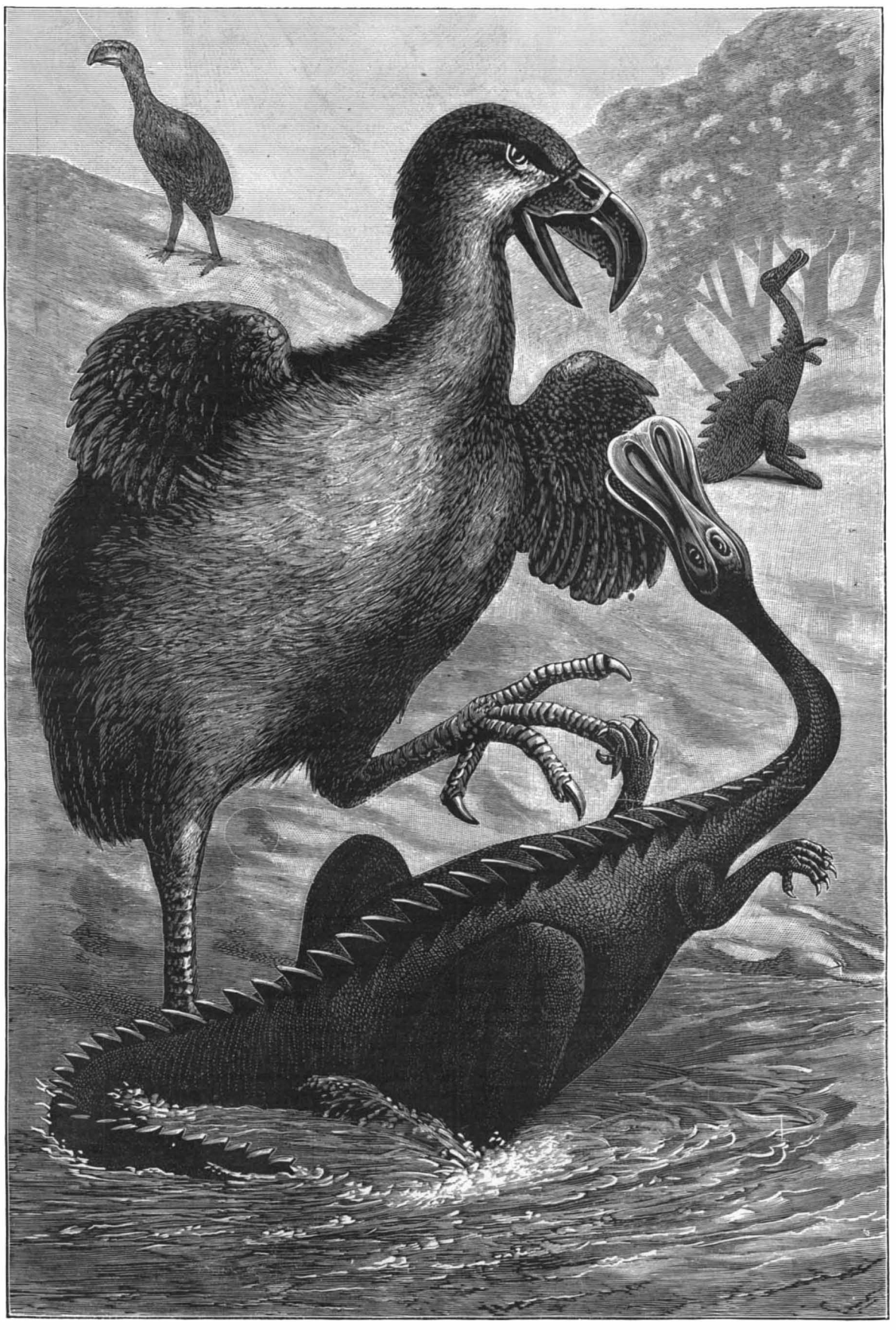


Fig. 2.—RESTORATION OF THE BRONTORNIS BURMEISTERI.

The bird is represented as attacking a dinosaur (Hadrosaurus), which is seeking refuge in a swamp. A Phororhacos longissimus is shown at the upper left hand side of the engraving.

Ships.

Few people stop to consider the varied industries that are interested in a ship. The tax gatherer seldom thinks of the benefits derived by a community in which ships are owned. The industries directly concerned in a vessel are alone sufficient to encourage shipping as a business and to discourage the assessment of local taxes of any kind.

The Maritime Register, of New York, directs attention to a few of these. There is the builder, the owner, the iron manufacturer, the engine builder, the chain and anchor maker, the spar maker, the canvas and sail maker, the various manufacturers who furnish provisions, fittings, electric lights, and various goods that enter into the make and supply of a ship as much as into the building of a hotel; the cargo owner, the many buyers of the varied cargoes, the underwriter, the numerous middlemen that arrange for everything in the supply, employment, and management of the ship and in the buying and sale of her cargo; the warehousemen, the crew, the men who live on the crew, the tugs, and the wharfinger. There are many trades besides directly engaged and depending almost entirely upon the ship for support. There are also to be added those trades that supply goods to and are but ramifications of those directly concerned in the making and running of the ship itself. Indeed, when the list is considered as a whole, it may be claimed that no single industry is as important as shipping in the variety of trades that it practically creates and supports, or as valuable to a country in its influence upon the general business and commercial welfare of a country. It needs no other argument, therefore, to support the assertion that it is of the very greatest necessity and of immense advantage for this country to be a ship owner.—Marine Review.

Duplex Personality.

Dr. R. Osgood Mason, in a recent paper on "Duplex Personality: Its Relations to Hypnotism and also to Lucidity," makes the following points: First, that there are now on record many well authenticated cases where, from a condition of syncope brought about by pain, weakness, or long-continued illness from epileptiform attacks, loss of consciousness from shock or other physical causes, patients have emerged into an entirely new and unusual condition. In this new condition the individual thinks, speaks, and acts in a manner entirely different from the usual or primary personality. Even physical conditions are changed. In one case, from a condition of wretched bodily health accompanied by epileptiform attacks, indolence, and melancholia, the patient emerged into a state of excellent health accompanied by industry and cheerfulness, and without a trace of epilepsy, hysteria, or melancholia; in fact, it was an entirely new and different consciousness and personality. During this second condition the primary consciousness is entirely blotted out, and the time so occupied is a blank. The second consciousness or personality, on the other hand, knows of the primary self, but only as another and distinct person, having no special relations to itself, and with whom it does not wish to be confounded. It has opinions, sentiments, memories, a personal history, in fact a character altogether independent and often entirely different from the primary self, but sane, consistent with itself, and in harmony with its surroundings. This second personality may continue for a few minutes or hours, and may alternate frequently with the primary self, or it may remain months and even years at a time and so become the dominant personality, alternating only seldom with the primary self. In either case all the occasions when this second self is present are linked together in one distinct chain of memories, forming a personality just as consciously distinct as the primary self. On close examination and comparison it is found that this second personality presents very marked analogies to the condition of somnambulism in ordinary sleep. Again, it is found to be identical with the condition of somnambulism which occurs in the hypnotic state, and in some instances, as that of Ansel Bourn, the second personality has repeatedly been brought into activity by hypnotism.

Here, then, are three distinct conditions in which a second consciousness or personality is brought to the surface and becomes the ruling personality to the exclusion of the primary self, namely, loss of consciousness from disease, shock, or other physical causes, ordinary sleep, and the hypnotic trance. Examining closely the personalities apparent in these conditions, and especially in the condition of ordinary somnambulism and that of the hypnotic trance, we find certain supra-normal faculties present in these new or second personalities not present in the normal or primary personality, especially the faculty of supra-normal vision. This alleged fact is not generally accepted, because, from the standpoint of the ordinary laws of optics acting upon physical organs, such vision is of course impossible. But within the past ten years the subject has been systematically studied as never before, and the evidence of such vision is simply overwhelming. But it is the subliminal self, and not the primary self, which possesses this power. This supra-normal vision is also sometimes exercised in dreams and in reverie.

The following conclusions are drawn: 1. That there does exist in some persons, probably in all, a subliminal self or second personality, whose action is not strictly limited by the physical body, and which possesses perceptive powers far exceeding those of the primary self. 2. That lucidity or clairvoyance is an attribute of the subliminal self, and in that view is perfectly reasonable and is a proper subject of investigation by scientific methods. 3. That hypnotism is a means of experimentally bringing this subliminal self with its added perceptive powers into action.—Med. Record.

New Uses for Peat.

German chemists have been experimenting with Irish peat, and have secured such remarkable results that a syndicate has been formed for the manufacture, on a commercial scale, of the various products that may be obtained from Ireland's bog lands. One of these products is an antiseptic "wool" for dressing wounds. It possesses absorbent qualities so great that it will soak up nine times its weight of moisture. The medical department of the French army has adopted this substitute for lint, and 12,000 kilogrammes of it were sent with the expeditionary force to Madagascar. By a different process of chemical treatment the peat is formed into a material from which any article requiring hardness and durability can be produced. The German syndicate has now on exhibition in London insulators, axle boxes, machinery bearings, gun stocks, pianoforte legs, and numerous other things to illustrate the possibilities of this new material.

Peat has been used in this country for lining refrigerators and cold storage rooms, and to some extent as a covering for steam pipes, because of its value as a non-conductor of heat. But by these new German processes a wide field appears to have been opened, in which capital and labor may be profitably employed, and the Irish peat bogs acquire a value hitherto unknown. One of the largest beds of fine peat in this country underlies the Great Dismal Swamp of Virginia. If the experiments of the German chemists should ultimately result in a large utilization of Ireland's peat deposits, it will not be long, says the Worcester Spy, before some American chemist determines whether Virginia peat can be treated in like manner and the same products be obtained.

Fruit in Glass.

A new vacuum process of canning fruits in glass has lately been introduced from Europe among the packers of the Pacific coast, and according to Mr. Charles H. Shinn, writing in the American Agriculturist, the tin can appears to be doomed. All the deleterious gases generated in cooking the fruit, and even the air, are extracted under this new process, so that fermentation is reduced to a minimum. No solder is used, and each jar is opened by making a puncture with a penknife, after which the cover can be lifted off entire. The fruit is solid-packed—that is, a can contains 90 per cent of fruit and 10 per cent of sirup, instead of being two-thirds fruit and one-third sirup, as was formerly the case with tin cans. In this way there is a saving of freight charges, while the superior attractiveness and healthfulness of fruits packed in glass is evident. Formerly the use of resin, acid, solder, and hot iron scorched the sirup, and since the aperture in the top of the tin cans was so small that the fruit was often crushed and cut when being placed in the cans, the sirup was for this reason cloudy. By the new method the sirup will be clean and clear, and cheaper grades of fruit will be almost as good as the higher ones, especially where the difference is only in the size of the fruit.

A New Police Signal.

A sample signal box has been submitted for adoption by the Police Department of New York.

The insertion of a key in the outer door of the signal box brings a patrol wagon and two policemen, while the sergeant in the nearest station house waits to be called up on the telephone which is inside the box, to learn what the trouble is.

While on his rounds a policeman must pass these boxes at regular intervals. As he passes he opens the box, pulls a hook which is within and goes on. The pulling of the hook records at the station house the number of the box and the exact moment the signal is sent in. It will prevent shirking duty by policemen.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Thomas Gaskins, Arcadia, Fla. This is an improvement on a formerly patented invention of the same inventor, providing an improved construction of the locking lever and the pin with which it engages, whereby the couplings will lock or couple the cars when the train is standing on a curve as well as on a straight line. It is a knuckle coupling, and the locking lever has a segmental head with an intermediate notch between its front and rear sides for engagement with the pin to couple the cars when standing on a curve.

Electrical.

IGNITER FOR GAS ENGINES.—Frank S. Mead, Montreal, Canada. This device comprises a fixed electrode and a movable electrode mounted eccentrically on an oscillating or revoluble shaft, and arranged to give a strong snap spark from the primary circuit of an electric battery to insure a positive ignition of the explosive mixture at the proper time. The igniter is very simple and inexpensive to manufacture, and readily applied to any form of gas or oil engine.

ELECTRIC RAILWAY SYSTEM.—Henry A. Fry, Portland, Oregon. For an underground conduit road this system provides a novel construction and arrangement of the conduit, its insulating supports, the slot rails and the trolley. The slot rail has a horizontal surface flange, a vertical pendent slot flange, and an inclined outer flange joining on to the horizontal surface flange and forming a housing or inclosure for an electric conductor. The insulating conductor hanger consists of a pair of hinged clamp hooks having a screw stem on which turns a headed sleeve compressing the jaws, an insulated casing inclosing the sleeve.

Mechanical.

WRENCH.—Joseph Ford, Grafton, North Dakota. This is an improvement in pipe wrenches, the invention providing a tool in which the wrench head devices may be readily converted into a cutter head, the swinging jaw, in the use of the implement either as a wrench or cutter, permitting the wrench face or cutter to alternately slip and operate as the handle is reciprocated. Either the wrench or cutter jaw faces may be readily adjusted to the head, a reverse movement of the handle setting the jaw off the head.

COOPERING MACHINE.—Theodore F. Hummel and William S. Morse, Fremont, Neb. These inventors provide an improved machine for chamfering and crozes the article at the small end, the second cutter head chamfering the inside at the large end, and the third chamfering the outside on the large end.

Mining, Etc.

MINERS' SAFETY LAMP HOLDER.—Philip G. Smith and Abraham L. Ruff, Dickerson Run, Pa. This holder comprises a post made in two sections sliding one upon the other, their pointed ends engaging the roof and bottom of the mine. One section has notches engaged by a spring-pressed locking plate, by means of which the operator may lengthen or shorten the post, a pin supporting the lamp being entered in one of a series of apertures provided therefor.

Agricultural.

SILO.—William A. Van Deusen, Sprout Brook, N. Y. This silo has a wood floor in a concrete bed, is preferably circular, double walled, and airtight, and is provided with a piston worked by a lever and gear mechanism to thoroughly compress the ensilage, which is kept level by a revoluble rake. A convenient system of doors is provided by which the ensilage may be removed from the silo with as little exposure to the remaining ensilage as possible, greatly facilitating the perfect preservation and handling of the ensilage.

GRAIN SACK.—Emons H. Lobdell, Mecosta, Mich. This sack has a reinforcing strap secured to opposite sides and extending around the lower edges and across the bottom, the strap being unattached at various points and rendered full at its unattached points, forming handles. These hand-holds serve to hold the sack straight at the bottom, and no matter in what position the sack may be it can be readily and conveniently handled, one or more of the handles being always available for use.

Miscellaneous.

HARMONICA.—Samuel Jesselson, New York City. A reversible dustproof case is provided by this inventor for an instrument made with grooves or slideways in four longitudinal surfaces, the case being constructed to assume two different positions, in one position exposing the blow holes and the exhaust openings, while in the other position the blow holes and openings will be closed, enabling the instrument to be carried in the pocket or stored away where dust cannot reach it. By reversing the instrument it may be performed upon as readily when within the casing as when removed therefrom.

WIRE FENCE STAY.—Alexander French, Elizabethtown, Ky. For stiffening and supporting the wire strands between the posts and holding them from sagging, this inventor provides a link member hung pendent from the uppermost of the wires and a hook member embracing two of the horizontal wires, its upper end terminating in an eye portion embracing one of the horizontal wires, with a terminal coiled about the wire and separated from the eye by a space which allows lateral play of the link. The self-closing link member serves to hold the several parts of the stay in proper position, holding the fence level without requiring that the wires be drawn tight.

WIRE CLAMP.—Amasa A. Armstrong, Ionia, Mich. This is a device especially adapted for use in placing fence and telegraph wires upon posts and poles, holding the wire firmly and securely and being readily applied to and removed therefrom. The body of the clamp has converging diagonal slots, and cam levers pivoted on the body have longitudinal slots, while links pivoted to a block have pins working in the slots of the levers and body. By employing two pairs of cam levers the range of the clamp is increased, one pair being used for one size of wire and the other for another.

SHUTTER FASTENER.—Oswald Knight, Richmond, Va. This is a "bar" fastener with means for fastening the bar crosswise or otherwise adjusting it to permit opening the door. The bar is fulcrumed on a bolt passing through to the outer side of the door or building, the bolt having a perforated outer end adapted to receive a padlock. The bar may then be readily swung into its end fastenings on the inside, but one having a key may remove the padlock and push the fulcrum bolt inward, thus releasing the cross bar.

CHAIN FASTENER FOR DOORS.—Henry C. Jenkins, New York City. This is a fastener which may be very easily adjusted to permit the opening of the door to any necessary extent or to hold the door closed. The chain has a projecting portion of increased width and a notch in a bracket receives the narrower portion. A fastening latch has a recess to receive the bracket, the latch being pivoted to the bracket and adapted to close the notch over the chain, which is thus held against removal, a spring in the latch recess engaging the bracket.

FOLDING CRATE.—Julius Wolff, New York City. The bottom panel of this crate has upwardly projecting extensions at its ends and one side, and one side panel is hinged to the edge of the bottom panel and the other to the side extension, while panels are hinged to the end extensions of the bottom panel. The cover panels are connected by hinges to the end panels, each hinge consisting of a plate to which is hinged a yoke, a staple being secured to the cover panel and the plane of the staple being at right angles to that of the yoke.

BARREL COVER.—William L. Walsh, Easton, Pa. This is a cover for barrels from which goods are retailed, keeping their contents from the air, and also being adapted to exhibit a sample of the contents. The cover has an edge flange overlapping the sides of the barrel and a central opening in which is held a box having a transparent top, the bottom of the box being formed by a slide. On the upper side of the cover are handles, and the entire device is strong and simple.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

AMERICAN STEAM VESSELS. By Samuel Ward Stanton. New York: Smith & Stanton. 1895. Oblong 4to. Pp. 500. 817 illustrations. Price $5.

In this work, which is handsomely printed in several colors, will be found illustrations and descriptions of almost every known type of successful steam vessel that has ever been built in the United States. The pictures are arranged in chronological order, the first representing Robert Fulton's Clermont, which was built by Robert Fulton in 1807. Then follow illustrations of the Hudson River steamboat Hope, the Delaware River steamer Philadelphia, the first war steamer Demologos, the Sound steamer Chancellor Livingston, the great lakes steamer Walk-in-the-Water, and the pioneer transatlantic steamship Savannah, which sailed from Savannah to Liverpool in 1819. From these early examples of steam vessels the work traces the gradual development of American steamships and steamboats until such noble examples of the product of American ship yards are reached as the St. Louis, the Priscilla, the Northwest, and the Minneapolis—vessels which compare favorably with any of those built abroad. The pen drawings, borders, etc., were made by the author artist. The data regarding the vessels and their runs are very valuable.

ELECTRICITY IN OUR HOMES AND WORKSHOPS. A practical treatise on auxiliary electrical apparatus. By Sidney F. Walker. London and New York: Whittaker & Company. 1895. Pp. 350. 143 illustrations. Price $2.

This work treats especially of the principles which underlie the science, and gives great attention to the practical uses of electricity. For example, electric bells, electric mining signals, telephonic apparatus, etc. The section relating to electric mining signals is especially complete. This is the third edition of Mr. Walker's well known book. The section relating to telephony has been much enlarged.

THE ARCHITECT'S DIRECTORY FOR 1895–1896. New York: William T. Comstock. 1895. 110 pp. Price $1.

This little pamphlet contains a list of the architects in the United States and Canada classified by States and towns, with the architectural associations to which they belong indicated against each name, together with a classified index of prominent dealers and manufacturers of building materials and appliances.

EXAMINATION OF WATER FOR SANITARY AND TECHNIC PURPOSES. By Henry Leffmann, M.D., Ph.D. Philadelphia: P. Blakiston, Son & Company. 1895. Pp. 154. 16mo. 12 illustrations. Price $1.25.

This is the third edition of a valuable work. The present edition is entirely due to Dr. Leffmann, Dr. William

Beam not collaborating in this edition. A thorough understanding of the methods laid down for the analysis of water will enable any chemist to judge of the potability of a water. Unfortunately, examinations of water are frequently not performed in the most thorough manner, so that any work which tends to assist the chemist to make more accurate determinations is a desirable addition to chemical literature. Dr. Leffmann says: "There can be no question that many of the published results as to bacteriologic examinations of water samples are without value. . . Whatever may be the shortcomings of the standard analytic examinations, it seems probable that for some years to come at least, the results will remain the most satisfactory basis for judgment as to the potability of a water." The section devoted to the purification of water for technical purposes is valuable, and it is only to be regretted that this subject was not treated more at length.

A HANDBOOK OF GARMENT DYEING AND CLEANING. By George H. Hurst, F.C.S. London: Charles Griffin & Company, Limited. Philadelphia: J. B. Lippincott Company. 1895. Pp. 180. 12mo. 32 illustrations. Price $1.75.

This book gives details of the methods used in large establishments in cleaning and dyeing garments. It deals with the technology of the textile fibers, the dry process of cleaning, the wet process, job dyeing of fabrics of all kinds, dyestuffs, mordants, dyeing machinery, finishing cleaned or dyed fabrics, scouring and dyeing of skin rugs and mats, cleaning and dyeing of feathers and straw bleaching and dyeing. In the appendix is described the curious process of "dry dyeing" in which water as the vehicle in which the dyes are dissolved is done away with, thus preventing shrinking. The vehicle employed in the new system is benzine or petroleum spirit in which coal tar colors are soluble. The goods are immersed in the bath until they have become dyed to the right shade, they are then wrung out and dried. Coal tar colors not originally soluble in the petroleum vehicle are described as being treated with some agent to make them soluble.

THE HEART OF A BOY. By Edmondo de Amicis. Translated by Professor G. Mantellini. Chicago: Laird & Lee. 1895. Pp. 290. 12mo. Illustrated.

"Cuore" is a classic in the literature of education. Pupils, teachers, and parents are alike held and taught by its expressive story. The present edition is from the 166th Italian edition. Signor Edmondo de Amicis is one of the most charming writers of the modern Italian school and his "Holland and Its People" is one of the most delightful books of travel which have been written.

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Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6619) W. H. B. asks: 1. A steamboat is going 20 knots through the water, with a 5 knot tide; how much will her log register—will it register over 20 knots? A. Will register only 20 knots. 2. Will tide running against an 8 knot boat affect her speed any more than it would a 20 knot boat going against the same tide? If the tide was running 5 knots against each, would they not each make 5 knots less per hour? A. No. The log only registers the speed of the boat through the water. The amount of the current must be subtracted from the boat's speed when running against the current, and added when running with the current, for their running time by land measure

(6620) J. M. says: I have a building 10 feet by 12 feet; it is sided outside and ceiled inside, and has a floor in it; can I keep ice in it by using plenty of sawdust, or will I have to take the floor out? A. The floor should be taken out and a good drain made; outside of house should be banked up with earth as much as possible to prevent circulation of air, and with a foot of sawdust all around the sides, and 2 feet on top of the ice, you will make a fair ice house. 2. What kind of starch do the Chinamen use, or do they use anything else to get the fine gloss on linen goods? A. The Chinese use ordinary starch, with a weak solution of borax and gum Arabic.

(6621) F. W. F. asks if there is any way, and how, that you can tell how far a stream of water can be thrown through 50, 100, 200, or any number of feet of hose when the hydrant pressure is given, the hose being 2½ inches and the nozzle pipe 1⅛ inches diameter? A. The principles and rules for computing the distance and height of fire streams and the friction in fire hose for various pressures and velocities are explained and illustrated in SCI. AM. SUP. No. 792, 10 cents mailed.

(6622) H. B. C. asks how to destroy aphides. A. To destroy common plant lice (Aphides) and other insects in the greenhouse and garden, the following remedy has been recommended by M. Cloetz, of the Jardin des Plantes, in Paris: 3½ ounces quassia chips, 5 drachms of stavesacre seeds, powdered and placed in 7 pints of water, and boiled until reduced to 5 pints. Dr. Hull recommends dusting slaked lime on the trees or bushes when the foliage is wet; syringing with soapsuds or tobacco water, or a strong decoction of quassia with soapsuds; also a weak solution of chloride of lime is said by Mr. Andrews to preserve plants from insects, if sprinkled over them. The following recipe is also highly recommended in an English horticultural journal as being almost infallible for mildew, scale, mealy bug, red spider, and thrips: 2 ounces flour of sulphur worked into a paste with water, 2 ounces washing soda, ½ ounce of common shag tobacco, and a piece of quicklime about the size of a duck's egg. Pour them all into a saucepan with 1 gallon of water, boil and stir for a quarter of an hour, and let the whole settle until it becomes cold and clear. It should then be poured off, leaving the sediment. In using it add water according to the strength or substance of the foliage. It will keep good for a long time if kept closed.

(6623) W. M. T., Jr., asks how to put titles on photographs. A. To print the name on the photograph, several methods may be adopted. The simplest is to write the title of the subject on a slip of paper with aniline copying ink, or with ordinary copying ink mixed with gamboge or vermilion. Then slightly dampen the surface of the negative near the bottom right or left hand corner in as unobtrusive and unimportant a portion of the picture as possible. Press down the paper with the writing upon it. Leave for a few minutes and then remove the paper, when the writing will be found to have adhered to the negative. When printed, the name will print out white. Another way is to write backward on the negative, while another and better plan is to write the name in Indian ink on the surface of the paper before it is printed on. The ink will wash off in the after operations and leave the name in white where the surface of the paper has been protected by the ink.

(6624) B. T. M. asks for information concerning perry. A. A fermented liquid, prepared from pears in the same way as cider is from apples. The drecued pulp must not be allowed to remain long without being pressed. In the cask, perry does not bear changes of temperature so well as cider. It is therefore advisable, if at the end of the succeeding summer it be in sound condition, to bottle it, when it will keep perfectly well. The red, rough-tasted sorts of pears are principally used for making perry. They should be quite ripe, without, however, approaching to mellowness or decay. The best perry contains about 9 per cent of absolute alcohol; ordinary perry, from 5 per cent to 7 per cent.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 17, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acid and making same, amido-tetrazotic, J. Thiele ... 546,604
Acid, process of and apparatus for making sulphuric, N. P. Pratt ... 546,596
Adjustable joint, O. C. White ... 546,459
Air brake, T. J. Hogan ... 546,448, 546,449
Air brake, railway car, D. Dunn ... 546,510
Album, S. Martin ... 546,337
Ale, etc., under pressure, apparatus for coloring, G. W. Robinson ... 546,458
Amalgamator and separator, G. A. & D. C. Blinn ... 546,378
Annealing furnace, Prust & Watkins ... 546,432
Anode for electrolytical apparatus, C. Hoepfner ... 546,328
Asphalt heating and mixing machine, R. Butcher ... 546,444
Atomizing and burning apparatus, fluid fuel, H. C. Fellenbaum ... 546,397
Auger, earth, E. Harper ... 546,529
Autographic register, G. A. Norcross ... 546,427
Automatic gate, D. M. Everton ... 546,381
Baby walker, S. Kell ... 546,333
Bag fastener, N. Brown ... 546,484
Band cutter and feeder, J. L. Barker ... 546,291
Banjo tailpiece, E. Jacoby ... 546,536
Barrel support, H. S. Covey ... 546,395
Bat, ball, A. H. Kennedy ... 546,540
Bearing, ball, T. J. Reid ... 546,557, 546,558
Bed bottom, spring, A. E. Beall ... 546,293
Bedclothes holder, R. T. Joy ... 546,538
Beer, apparatus for pasteurization of, W. Wirtz ... 546,393
Bellows, A. M. Wickenberg ... 546,370
Belt shifting device, O. R. Kuner ... 546,618
Bicycle frame and finishing same, G. Gross ... 546,446
Bicycle saddle, B. S. Seaman ... 546,350
Bicycle support, J. K. Getty ... 546,612
Bicycle toe clip, A. A. Bevin ... 546,412
Bicycle wheel, Le Blanc & Johnson ... 546,593
Billiard or pool table shade and reflector, E. F. Gennert ... 546,611
Bin. See Flour bin.
Binder, bundle, F. A. Hedges ... 546,326
Binder, temporary, E. B. Millert ... 546,492
Bird trap, F. Maierhofer ... 546,491
Blasting powder, B. C. Pettingell ... 546,552
Boiler gage, steam, M. Doerhoefer ... 546,589
Boiler, skimmer and throttler, automatic, J. Austin ... 546,290
Bolt. See Rotary bolt.
Bookholder and advertising device, C. L. Whipple ... 546,479
Book rest, adjustable, J. F. Young ... 546,570
Bottles, device for preventing refilling of, A. P. Francis ... 546,590
Brake. See Air brake.
Breast straps, center fastening for, E. J. Clark ... 546,300
Burner. See Gas burner.
Button, I. G. Platt ... 546,431
Button, G. Rossberg ... 546,598
Buttons to shoes, etc., metallic fastener for attaching, I. J. Saunders ... 546,349
Calculator, electric, W. C. Porter ... 546,553
Calendering rolls, pressure controlled apparatus for, A. S. Woodward ... 546,480
Can. See Oil can.
Car buffer and continuous draught device, G. E. Shuey ... 546,561
Car coupling, W. A. Keahey ... 546,539
Car coupling, automatic, A. E. Singer ... 546,601
Car door fastener, T. C. Kennedy ... 546,541
Car fender, J. F. Girtler ... 546,521
Car wheel, S. B. Dearing ... 546,609
Cars, construction of railway, G. C. Kubiman ... 546,592
Cars, construction of railway, J. P. Maher ... 546,541
Carriage washing device, C. G. Trefethen ... 546,366
Cash register, F. J. Petersen et al ... 546,342
Cast or banking, Davis & Davey ... 546,608
Celery package, S. J. Dunkley ... 546,463
Cheese or butter cutter, E. G. Bennett ... 546,377
Chocolate dippers, apparatus for filling, C. Gousset ... 546,525
Chopper. See Meat chopper.
Chuck, W. W. Tucker ... 546,439
Cigarette machine, W. H. Butler ... 546,638
Cigarette machine, W. A. Hulse ... 546,452
Cigarette tubes, machine for making paper, C. A. Marchal ... 546,404
Cigarettes, method of and machine for making, W. H. Butler ... 546,637
Cigarettes, method of and mechanism for making tobacco, W. A. Hulse ... 546,451
Clamp. See Pipe joint clamp. Soldering clamp.
Clevis, plow, E. W. Kruse ... 546,645
Closet. See Dry closet.
Clothes drier, W. M. Rowley ... 546,559
Clutch operating mechanism, H. W. Hill ... 546,327
Coloring matter, black, R. Bohn ... 546,576
Combing machine, Sharp & Metcalfe ... 546,600
Compensator, D. Whitmore ... 546,569
Conveyer, W. T. Ferguson ... 546,315
Corn husker and fodder shredder, combined, G. W. Packer ... 546,550
Cornice, window shade, D. Boyer ... 546,296
Costume, bicycle and walking, M. L. Peck ... 546,496
Coupling. See Car coupling. Pipe coupling. Thill coupling.
Cover, milk can, L. Sturges ... 546,498
Crane, traveling, J. McCoy ... 546,426
Crank, W. E. Gard ... 546,520
Culinary utensil, E. O. Rabon ... 546,554
Cultivator, H. C. Kinner ... 546,334
Curbing, street, A. O. Jones ... 546,332
Cut-out, electric fusible, D. N. Gleason ... 546,613
Cutlery, table, Barry & Shaughnessy ... 546,376
Cutter. See Band cutter. Cheese or butter cutter. Feed cutter.
Cutting device, C. A. Byrd ... 546,607
Dental flask press holder and heater, M. R. Griswold ... 546,465
Dividing apparatus, L. Von Koppen ... 546,336
Dough dividing machine, C. Hesse ... 546,468
Drain, stall, F. Steinle ... 546,478
Dredger W. H. Diestelhorst ... 546,586
Drier. See Clothes drier.
Drilling machine, portable, G. Stites ... 546,628
Driving machine safety attachment, C. A. Copeland ... 546,416
Dry closet, H. A. Hecox ... 546,531
Electric circuits, connector for terminals of, J. E. Neber ... 546,472
Electric converter, C. F. Scott ... 546,476
Electric generator, thermo, H. B. Cox ... 546,417
Electric motor, F. H. Williams ... 546,442
Electrodepositing apparatus, H. L. Bridgman ... 546,483
Electrolytic apparatus, W. A. Rosenbaum ... 546,348
Electrolytic apparatus, A. Sinding-Larsen ... 546,353
Elevator controlling device, J. McAdams ... 546,406
Embalming couch, W. Clouser ... 546,302
Embossing machine, T. Nesom ... 546,621
Engine. See Rotary engine.
Engraving machine, J. G. Kingsbury ... 546,542
Envelope machine, E. Rau ... 546,433
Evaporating apparatus, liquid, L. F. Haubtman ... 546,530
Exercising machine, A. A. Whitely ... 546,568
Eye shade, A. R. Brandly ... 546,636
Fan, ventilating, F. W. Tuerk, Jr ... 546,630
Fastening device, M. L. Brown ... 546,578
Fatty substances, apparatus for extracting, E. Donard ... 546,509
Feed cutter and corn husker, A. Rosenthal ... 546,390
Fence stay, L. Clark ... 546,301
Fence wire stretcher, E. H. Baugh ... 546,575
Filter, A. Gudeman ... 546,527
Filter, E. M. Knight ... 546,335
Filter, mechanical or bag, L. A. Philippe ... 546,343
Filtering machinery, H. C. Atkins ... 546,634
Fire kindler, vacuum, N. H. Smith ... 546,356
Fireproof partition, ceiling, etc., T. Bailey ... 546,502
Fishing reel, A. J. Arnold ... 546,633
Floor or ceiling plate, A. J. Beaton ... 546,461
Flour bin, J. M. Patton ... 546,473
Flue stopper, J. K. Randles ... 546,555
Foot, artificial, G. E. & W. L. Marks ... 546,405
Furnace. See Annealing furnace. Garbage furnace. Ore roasting furnace.
Fuse block, H. N. Potter ... 546,475
Fusee placer, railway, J. R. Wright ... 546,605
Gage. See Boiler gage.
Garbage furnace, M. V. Smith ... 546,497
Garbage furnace, W. Swindell ... 546,438
Garbage incinerator or destroyer, portable, H. C. Fellenbaum ... 546,396
Garment stretcher, G. H. Gregory ... 546,422
Garter, B. Dreyfus ... 546,420
Gas burner, M. J. O'Reilly ... 546,340
Gas burner, kerosene, A. J. Huber ... 546,644
Gas fuel generator, oil, R. & E. W. Barlow ... 546,375
Gasoline burners, stand pipe for, O. & L. W. Daman ... 546,642
Gate. See Automatic gate. Sliding gate. Swinging gate.
Gate, J. W. Henry ... 546,385
Generator. See Electric generator. Gas fuel generator. Hydrocarbon generator.
Gun stock, T. Prasse ... 546,344
Guns, cocking and safety mechanism for breaking down, E. Flues ... 546,516
Hair drying apparatus, W. S. Simpson ... 546,352
Handle, W. F. Greene ... 546,464
Harness, W. F. Walls ... 546,567
Harness loop, adjustable, S. R. Monroe ... 546,455
Harness unchecking device, Ferris & Hart ... 546,514
Harrow, F. H. Norton ... 546,549
Harvester platform and carrier, S. T. Compton ... 546,415
Hat blocking and stretching machine, J. C. Chamberlain ... 546,640
Hat holder, G. J. Johnson ... 546,402
Hat sizing, felting, and pinning-out machine, W. H. Knowles ... 546,453
Hay loader, O. & W. Swenson ... 546,602
Headlight and sand box, combined, I. H. Davis ... 546,581
Hook. See Shutter hook.
Hose bridge, I. Niskern ... 546,387
Hydrocarbon generator and burner, reversible, B. G. Devoe ... 546,310
Inkstand, J. C. Miller ... 546,338
Insect powder distributer, J. Hetherington ... 546,533
Insulated electric conductor, F. Clouth ... 546,579
Insulating railway joints for electrical signals, T. O'Brien, Jr ... 546,494
Insulator, Dibb & Vickers ... 546,585
Insulator, G. Gerstenlauer ... 546,383
Ironing board, H. Ratcliffe ... 546,556
Jack. See Pegging jack. Pumping jack.
Joint. See Adjustable joint. Universal joint.
Knitted fabrics, machine for cutting, J. D. Hemphill ... 546,532
Lacing books, making, H. H. Cummings ... 546,641
Lamp, H. E. Shaffer ... 546,435
Lamp, alcohol, L. Wojidkow ... 546,632
Lamp chimney holder, A. J. Beck ... 546,411
Lamp, electric arc, D. Higham ... 546,534
Lamp, electric arc, S. P. Parmly ... 546,388
Lamp, electric arc, H. A. Seymour ... 546,625
Lamp harp ring, F. Rbind ... 546,597
Lamp mechanism, arc, Lantau & Anderson ... 546,403
Lamps, pliers for trimming electric arc, R. D. Tackaberry ... 546,361
Latch, O. R. Winslow ... 546,373
Lathe work holding device, Dreses & Barker ... 546,311
Lawn sprinkler, R. T. Joy ... 546,537
Level, magnetic pendulum, T. Zanger ... 546,501
Lifter. See Transom lifter.
Lightning arrester and cut-out, O. Gieseke ... 546,523
Liquid discharging mechanism, A. D. Howard ... 546,615
Liquid meter, W. M. Fowler ... 546,317
Locomotive, electric, S. H. Short ... 546,560
Loom stop motion, W. H. Craig ... 546,418
Lumber on wagons, device for binding, F. Fountain ... 546,518
Mail bag catcher, J. E. Routh ... 546,599
Match box, J. B. Dennis ... 546,583
Measure, shoemaker's, A. S. Adler ... 546,287
Measuring tank, gravity, J. Hall ... 546,399
Meat chopper, R. L. Gore ... 546,384
Meat cutting machine, L. Steigert ... 546,437
Metals by electrolysis, apparatus for extracting, separating, and refining, D. Tommasi ... 546,364
Meter. See Liquid meter.
Mill products, proportional indicator for, A. C. Brantingham ... 546,413
Millstone balancing and leveling device, W. Weber ... 546,500
Motor. See Electric motor.
Motor, W. B. Bary ... 546,481
Music leaf turner, D. T. Fox ... 546,519
Musical instrument, E. J. Babbitt ... 546,374
Nail making and driving machine cutter, J. Boothman ... 546,577
Napkin holder, A. A. Vernon ... 546,566
Nozzle, exhaust, H. O. Olson ... 546,495
Numbering machine, Geary & Bracewell ... 546,382
Oil can, F. E. Heing ... 546,467
Oil distributer, Ericson & Phinney ... 546,485
Onyx from pyroxylin compound, production of imitation, Stevens & Harrison ... 546,360
Ore roasting furnace, H. P. Holland ... 546,450
Package for pulverulent materials, D. H. Greene ... 546,526
Paper box covering machine, J. Leo ... 546,489
Paper box machine, C. W. Gay ... 546,318
Paper cutting machine, self-clamping, A. Maim ... 546,454
Paper holder and cutter, roll, D. McLachlan ... 546,339
Paste, adhesive, C. M. Higgins ... 546,401
Pasting and mounting sheets, machine for, H. Carlisle ... 546,506
Pegging jack, W. H. Dilion ... 546,587
Pen, F. J. W. Fischer ... 546,515
Photographic developing tray, W. I. Rood ... 546,347
Piano, electrical, G. W. Davis ... 546,582
Pick or like tool, S. Boyton ... 546,505
Picker sticker cushioned stop, R. T. Taylor ... 546,563
Picture mouldings, device for hanging, J. Christmann ... 546,507
Pile wire, C. Ford ... 546,517
Pinwheel blank, C. A. Montgomery ... 546,456
Pipe coupling, P. H. Farrey ... 546,314
Pipe hanger, A. J. Beaton ... 546,462
Pipe joint clamp, J. Brice ... 546,298
Pipe wrench, E. Wright ... 546,443
Pipes, cleansing sink or drain, Cavallaro & Sturm ... 546,445
Pistol, magazine, H. F. Wheeler ... 546,369
Piston, H. Vogt ... 546,441
Piston and cut-off valve for steam engines, G. Murray ... 546,594
Piston, syringe, C. J. Tagliabue ... 546,603
Planter check rower, corn, J. C. Tunnicliff ... 546,409
Planter, corn, L. D. Benner ... 546,482
Planter, corn, L. C. Evans ... 546,456
Planter, potato, J. Horscroft ... 546,535
Plow, subsoil sulky, O. E. Howe ... 546,330
Pole, metal, L. S. Pfouts ... 546,622
Pole tip, F. De La Matyr ... 546,307
Pottery machine, C. Breitschwerth ... 546,297
Powder. See Blasting powder.
Pressure device, C. Sinning ... 546,354
Printing machine for printing from rotary flat forms, J. T. Hawkins ... 546,325
Printing press, J. Brooks ... 546,414

Propelling and steering vessels, mechanism for, E. F. H. Demnitz	546,309
Prying bar, T. C. Gatti	546,521
Puller. See Stump puller.	
Pump, double-acting, H. O. Thomas	546,362
Pump, steam, J. B. Erwin	546,313
Pump, vacuum, W. Kirkwood	546,617
Pump valve, H. E. Hunt	546,591
Pumping jack, W. C. Sheanfeld	546,626
Rail, Davis & Thomas	546,305
Railway, electric, H. M. Montgomery	546,546
Railway frog, H. Elliot	546,312
Railway frog, D. E. Shea	546,351
Railway, revolving gravity, J. S. Lake	546,386
Railway switch, H. C. Benagh	546,635
Railway tie shearing machine, Baugh & Murphy	546,574
Railway trains, system for controlling, A. L. De Leeuw	546,308
Railway, underground conduit for electric, H. A. F. Petersen	546,389
Rakes, weeder attachment for horse, J. M. Tufts	546,440
Reaping machine self-binding attachment, J. J. Gaynor	546,319
Reel. See Fishing reel.	
Register. See Autographic register. Cash register.	
Ribbon blocking machine, R. Atherton	546,289
Rim wrench, C. B. Loomis	546,490
Rolling mill feed table, J. A. Potter	546,623
Rotary bolt, L. Hertzler	546,400
Rotary engine, W. A. Webster	546,368
Rotary screen, adjustable, H. P. Grugin	546,447
Sash fastener, S. Hainkel	546,423
Saw gummer, Bradley & Ewing	546,394
Scow, steam garbage, G. W. Melville	546,545
Screen. See Rotary screen. Window screen.	
Seal, D. F. MacCarthy	546,619
Seaming covers to sheet metal vessels, F. E. Heinig	546,469
Shade holder, adjustable window, O. H. Nims	546,472
Shears J. Neimeyer	546,493
Sheathing and lath machine, combined, Gerbard & Bintner	546,522
Sheet metal vessel, F. E. Heinig	546,466
Sheet metal working machine, F. E. Heinig	546,468
Shoe, turned, G. H. Harland	546,323
Shoe, turned, T. W. Trimby	546,629
Shutter hook, B. H. Davidson	546,304
Sifting and sorting apparatus, K. H. A. Stitz	546,562
Signaling vehicles by numbers, apparatus for, F. Warren	546,499
Sleigh, E. L. Thoms	546,363
Sleigh shoe, detachable, H. H. Hahn	546,398
Sliding gate, L. Dearmont	546,306
Smocking machine, cloth, F. S. Pinkham	546,474
Soldering clamp, F. W. Duke	546,421
Soldering iron, J. C. McIntyre	546,470
Spear, fish or seal, H. F. Norton	546,428
Spinning frame, E. Whittum	546,460
Spokeshave, A. Gumz	546,321
Spoke socket, Elmer & Johnson	546,513
Spool carrying frame, J. Sommer	546,358
Spring. See Vehicle spring.	
Spring, India rubber buffer and bearing, A. Spencer	546,359
Sprinkler. See Lawn sprinkler.	
Stamp affixing machine, W. L. Dinsmoor	546,588
Steam trap, G. S. Brainerd	546,606
Stock for threading and cutting off rods, A. W. Bartholomew	546,573
Stoking apparatus, automatic, R. H. Williamson	546,371
Stool, duplex piano, A. Gschwend	546,614
Stopper. See Flue stopper.	
Stove, M. Schied	546,624
Stove, water heating, J. A. Wagle	546,367
Striking and testing machine, coin-controlled, G. Troxler, Jr	546,392
Stringed instrument attachment, A. Pietsch	546,457
Stringed instrument attachment, J. C. St. John	546,408
Stump puller, C. D. Edwards	546,511
Suspender end fastener, H. A. Hayden	546,424
Swinging gate, A. F. Cogbill	546,580
Switch. See Railway switch.	
Tank. See Measuring tank. Water tank.	
Teeth, artificial, Johnston & Carroll	546,331
Telegraphy, dynamo, A. S. Harris	546,324
Telephatic messages, apparatus for indicating, C. E. Campbell	546,299
Telephone, I. D. Smith	546,357
Textile machine top roll, R. G. Campbell	546,639
Theaters, construction of, C. L. Hagen	546,528
Thermometric circuit closer, R. Pearson	546,551
Thill coupling, E. L. Devereaux	546,584
Thill coupling, N. South	546,477
Thrashing machine, G. E. Wilson	546,372
Tinning machine, J. B. Baird	546,571
Tire inflating device, pneumatic, C. R. Hoffmann	546,329
Tobacco granulating machine, G. A. Turner	546,565
Tramway, aerial, J. H. Dickinson	546,508
Transom lifter, G. A. Colton	546,379, 546,380
Trap. See Bird trap. Steam trap.	
Trap, J. E. Kelly	546,616
Trolley pole for railway cars, R. Crommer	546,303
Trolley wire bracket, L. S. Pfouts	546,407
Trunk, cylindrical, N. S. O'Neall	546,429
Truss, J. M. Smith	546,355
Type casting machine, H. Barth	546,503
Type distributing rail, J. C. Fowler	546,610
Typewriter cabinet, M. J. Hafgar	546,322
Typewriting machine, E. E. Barney	546,392
Universal joint, O. C. White	546,632
Valve gear, engine, J. Deam	546,419
Valve, steam engine, A. H. Ford	546,316
Vault light, W. Towle	546,365
Vehicle gear, N. A. Palmer	546,430
Vehicle spring, S. D. Reynolds	546,345
Vending machine, coin-controlled, W. Wyand	546,410
Wagon, S. D. Reynolds	546,346
Wagon, dumping, G. W. Pellet, Jr	546,341
Wall paper, paints, etc., moistener or softener for, B. R. Blaisdell	546,504
Washing machine, W. Haas	546,487
Watchcase, F. Kohli	546,543
Watchcase pendant, F. Moorfield	546,547
Watchcase pendants, die for making, F. Moorfield	546,548
Water bandage, B. F. Springsteen	546,436
Water supply apparatus, S. A. Politsky	546,595
Water tank, C. Theobald	546,564
Water tower, E. F. Steck	546,627
Wheel rim, vehicle, F. L. Goodrich	546,320
Whirl for filler frames, R. Atherton	546,288
Whist, apparatus for playing duplicate, F. L. Barrows	546,572
Windmill, F. J. McCormick	546,425
Windmill tower, J. H. Miller	546,620
Window screen, J. A. Durnbaugh	546,643
Wood cutting machine, E. E. Birkner	546,294
Wood shaping machine, C. H. Ellingwood	546,512
Wool from silk, separating, A. L. & G. M. Rice, 2d	546,434
Wrench. See Pipe wrench. Rim wrench.	
Wrench, C. Black	546,295

DESIGNS.

Bale, cotton, W. E. Anderson	24,686
Bar-rooms, main entrance for, E. Ringold	24,685
Belt, A. Spadone	24,679
Biscuit, H. D. Perky	24,688
Commode, C. R. Hamman	24,687
Can rack, A. H. Davison	24,680
Gem cluster setting, M. E. Oppenheimer	24,678
Handle bracket, J. I. Flanagen	24,682
Hatpin, C. E. De Lue	24,677
Meat chopper frame or casing, J. W. Brown, Jr	24,681
Type, font of, C. H. Beeler, Jr	24,684
Type, font of, W. P. Quentell	24,683

TRADE MARKS.

Bicycles, Indiana Bicycle Company	27,082
Blue, laundry, William Edge & Sons	27,077
Burners for lamps, lanterns, oil stoves, and kindred articles, American Burner Company	27,080
Cigars, W. Seelenfreund	27,075
Cough drops, R. B. Stiles' Sons	27,069
Dandruff cure, C. H. Folkner	27,068
Dyes, William Edge & Sons	27,076
Flour, wheat, Regina Flour Mill Company	27,070
Glass and paints, E. Frohlich	27,079
Hides and skins, tanned, E. L. C. Schulz	27,067
Lard, leaf, Jacob Dold Packing Company	27,071
Mineral water, C. W. Mansfield & Company	27,073
Oils, A. C. Bragonier & Company	27,078
Printed music and songs and works of fiction, L. J. Libbey	27,066
Slate, roofing, R. B. Pritchard	27,081
Tea, Berry, Hall & Company	27,072
Whisky, J. H. Quell	27,074

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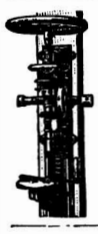

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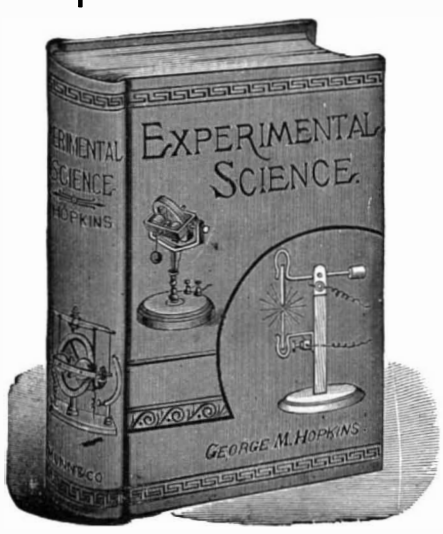

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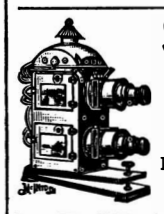

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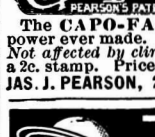

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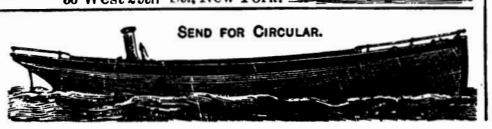

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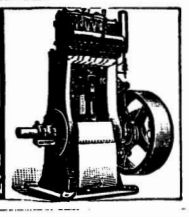

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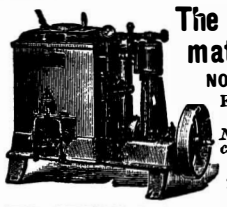

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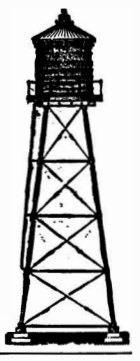

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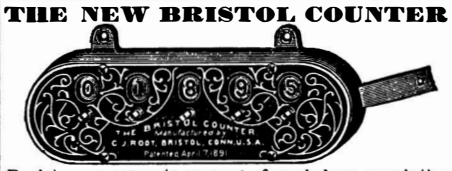

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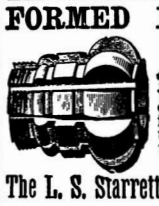

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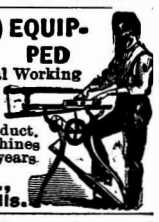

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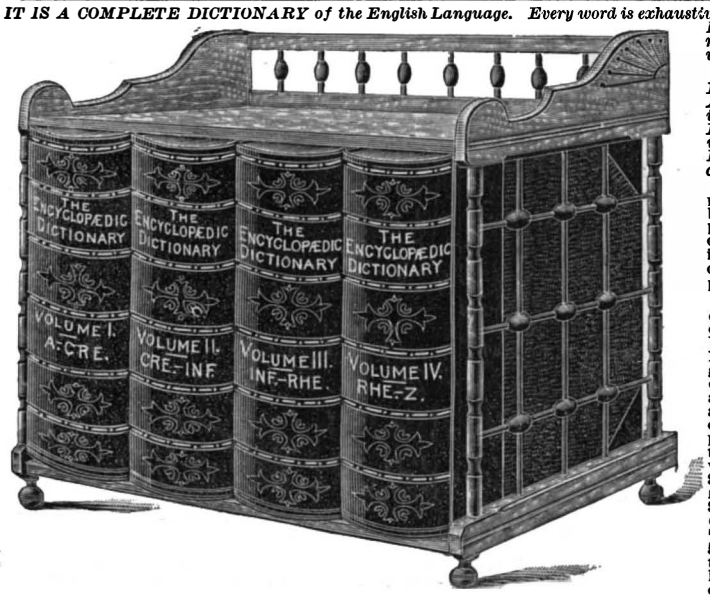

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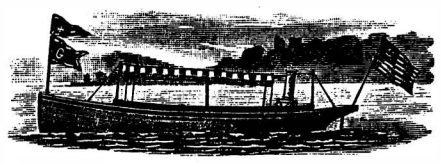

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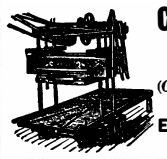

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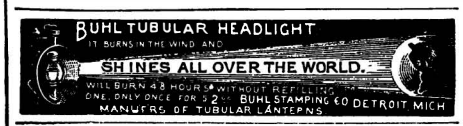

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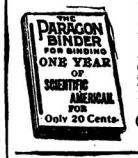

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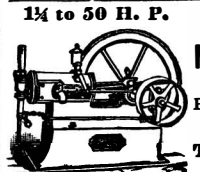

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